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TUBEUF [C. v.]. **Blattfleckenkrankheit des Götterbaumes Ailanthus glandulosa Desfont.** [Leaf disease of the Tree of Heaven, *Ailanthus glandulosa* Desfont.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliv, 6, pp. 309–316, 4 figs., 1934.

Attention is drawn to the occurrence, in the courtyards of Munich University, of a leaf disease of *Ailanthus glandulosa* which had previously been observed in Berlin and is also reported from Vienna.

A number of the pinnules of mature leaves develop small, irregularly shaped, dark green, glassy spots, scattered over the under surface, the epidermis of which appears to be raised. The affected parts assume a grey, granular aspect on the under side while the corresponding areas on the upper surface turn grey to brownish. Ultimately the diseased spots shrivel and drop out and the affected pinnules fall away from the midrib of the leaf, but there is no general extension of the disorder to the remaining pinnules, nor are the branches involved. No trace of bacteria or fungi could be detected in the diseased tissues, and the writer is inclined, pending further studies, to attribute the condition to a sudden increase of relative atmospheric and soil humidity, leading to a gorging of the most delicate tracheae of the leaves and injury to the adjacent parenchyma cells. This suggestion is supported by the occurrence of the disturbance in July and August, when a hot, dry spell is liable to be abruptly succeeded by overcast, chilly weather.

ANDRUS (C. F.). **Fungous flora accompanying decline of Boxwood.** —*Plant Disease Reporter*, xvii, 14, pp. 169–170, 1933. [Mimeographed. Received August, 1934.]

Notes are given on a number of fungi associated with the decline of boxwood (*Buxus sempervirens* and *B. suffruticosa*) in parks and estates in the District of Columbia. Severe twig and leaf infections were caused by *Volutella buxi* [renamed by von Höhnel *Chaetodochium buxi*: *R.A.M.*, xii, p. 634], the *Verticillium* stage of which (*V. buxi*) or *V. compactiusculum* is deeply systemic in many older plants. Immature perithecia of *Nectria rousseliana* [ibid., x, p. 34], believed to be the perfect stage of *Volutella buxi*, were found on *B. sempervirens* leaves early in August, 1933. Both species of box showed profuse infection by *N.* (?) *desmazierii*, frequently in conjunction with *Verticillium*. Other fungi of common occurrence included *Macrophoma candollei* [loc. cit.] on

both species, *Phoma conidiogena* [ibid., xii, p. 125] causing a silver-grey tip infection, *Phomopsis* (?) *stictica*, and *Phytophthora parasitica*, which is apparently a primary agent of decay in both species.

JØRSTAD (I.). **Om Heksekoster.** [On witches' brooms.]—'Festskr. til Olaf Hanssen', pp. 29–39, 4 figs., 1933. [Received August, 1934.]

Notes are given in popular terms on witches' brooms of trees and shrubs in Norway caused by *Taphrina* spp. [*R.A.M.*, vi, p. 762], various rusts, and unknown agencies [ibid., xiii, pp. 199, 283].

TIKKA (P. S.). **Über die Stockfäule der Nadelwälder Nord-Suomis (-Finnlands).** [On the butt rot of the conifer woods of North Finland.]—*Acta Forest. Fenn.*, xl, pp. 293–308, 2 pl., 3 figs., 1934.

The two principal agents of butt rot in the conifer woods of North Finland are stated to be *Fomes annosus* and *Polyporus borealis* [*R.A.M.*, xii, p. 739], the former producing a fibrous and the latter a brittle type of decay. Pine stands are less damaged than firs, only 6 to 12 per cent. of the trees in the former being attacked and the rot seldom extending above the butt, whereas firs have an incidence of 10 to 40 per cent. infection which attains a height of up to 1 m. Ecological conditions have been found to play an important part in determining the amount of butt rot in Finnish conifer stands, the health of which tends to be better on dry heathland than on swampy ground.

Fomitopsis annosa (Fr.) Karst. (= *Trametes radiciperda* Hart. = *Fomes annosus* Fr.) and *Bjerkandera borealis* (Fr.) Karst. (= *Polyporus borealis* (Wahl.) Fr.) are the names preferred by the author for the fungi under observation.

WOLLENWEBER (H. W.). **Fusarium bactridioides sp. nov., associated with Cronartium.**—*Science*, N.S., lxxix, 2060, p. 572, 1934.

A Latin diagnosis is given of *Fusarium bactridioides* n. sp., found in the Chiricahua Mountains, Arizona, parasitizing *Cronartium conigenum* [*R.A.M.*, ii, p. 3] on a *Pinus leiophylla* cone and subsequently shown by L. N. Goodding's inoculation tests in Oregon to be capable of attacking *C. ribicola* on *P. monticola*, and *C. harknessii* [ibid., ix, p. 147] and *C. filamentosa* on *P. contorta*.

The new species is characterized by continuous microconidia ranging from 5 to 11 by 3 to 5 μ, more rarely 1- to 2-septate, 7 to 21 by 3 to 6·5 μ; cylindrical or fusiform, straight or curved macroconidia, in sporodochia or pinkish-orange pionnotes, the stroma often showing a more or less intense purplish-black discoloration, 3- to 5-, occasionally up to 11-septate, measuring 17 to 47 by 4·5 to 7 (3-septate), 25 to 60 by 4·8 to 8 (5-septate), or 30 to 70 by 5 to 8 μ (7-septate); and sparse intercalary chlamydospores. The inoculation experiments amply demonstrated the efficacy of the fungus in rapidly destroying *C. ribicola* and the other rusts mentioned above.

ROBAK (H.). **Pholiota mutabilis (Schaeff.) Quél. som råtesopp på tremasse.** [*Pholiota mutabilis* (Schaeff.) Quél. as a rotting fungus on timber.]—*Friesia*, i, 2, pp. 91–94, 1 fig., 1933. [English summary. Received August, 1934.]

In February, 1933, fruit bodies of *Pholiota mutabilis* developed in malt agar cultures from a mycelium isolated from ground spruce pulp in Norway in the previous September. The fungus produces a vivid reddish-brown, sharply delimited rot, advancing at the rate of about 5 mm. daily in culture. It appears to be fairly widespread but not highly destructive.

ROBERTSON (W. A.). **Wood decay.**—*Journ. Soc. Chem. Ind.*, liii, 22, p. 493, 1934.

Rudge's theory of the primary importance of chemical agencies (as opposed to fungi and insects) in initiating the decomposition of structural timber [*R.A.M.*, xiii, p. 485] is considered by the Director of the Forest Products Research Laboratory, Princes Risborough, England, to be open to a number of objections [which are briefly summarized]. The experimental methods employed by Rudge are also criticized.

RUDGE (E. A.). **Wood decay.**—*Journ. Soc. Chem. Ind.*, liii, 23, pp. 511–512, 1934.

Replying to Robertson's criticisms of his theoretical and practical investigations on wood decay [see preceding abstract], the writer maintains that little or no advance in this problem, hitherto regarded as the exclusive province of the mycologist, botanist, and forester, has been made since the beginning of the eighteenth century. It is hoped that the studies under discussion, representing the first systematic attack from a purely chemical standpoint, may remove some of the existing difficulties.

HARKOM (J. F.). **Open-tank treatment of Red Pine lumber.**—*Dept. of the Interior, Canada, Forest Service Circ.* 40, 16 pp., 2 pl., 1934.

Full directions are given for the preservative treatment of red pine [*Pinus resinosa*] timber in Canada by the hot or cold open-tank process with creosote oil or zinc chloride [*R.A.M.*, xiii, pp. 138, 202, *et passim*], together with the tabulated results of experiments showing the application of the method in particular cases. The standard specifications of the American Wood Preservers' Association for both preservatives are appended.

CROSBY (C. R.) & CHUPP (C.). **The control of diseases and insects affecting vegetable crops on Long Island.**—*Cornell Agric. Exper. Stat. Extens. Bull.* 278, 87 pp., 9 figs., 1934.

This bulletin is stated to be an attempt to bring together the more pertinent information concerning the practical control of fungal, bacterial, and virus diseases, insect pests, and physiological disorders of the principal vegetable crops on Long Island, brief popular descriptions of which are also given. Besides material which was published in previous communications [most of which,

relating to the parasitic diseases, has been noticed from time to time in this *Review*], the paper also contains additional information from unpublished data of the research workers of the State experimental stations.

WILSON (J. D.). **Cabbage club-root in muck soils.**—*Ohio Agric. Exper. Stat. Bimonthly Bull.*, xix, pp. 58–65, 1934. [Abs. in Supplement to *Journ. Soc. Chem. Ind.*, liii, 34, p. 729, 1934.]

Club root of cabbage [*Plasmodiophora brassicae*] has not been found severe in Ohio soils having a hydrogen-ion concentration of P_H 7·3 to 7·4, and liming to attain this reaction, preferably with calcium hydroxide, is normally an adequate precautionary measure, especially in the greenhouse [*R.A.M.*, xii, p. 355]. Mercury preparations were the only fungicides with an appreciable degree of efficacy against this disease.

JØRGENSEN (C. A.). **Nogle Undersøgelser over Plantesygdomme med Frøsmitte.** [Some investigations on plant diseases from seed infection.]—*Tidsskr. for Planteavl*, xl, 1, pp. 119–147, 12 figs., 1934.

Investigations on seed infection in the following important vegetable diseases in Denmark are described. Nearly all the 89 celery seed samples examined in 1926–7 for the presence of *Septoria apii* [*R.A.M.*, xiii, p. 614] were infected to the extent of between 1 and 67 per cent., Non Plus Ultra being the most and Amager Market the least so. Control may be effected by spraying with copper-containing mixtures to prevent invasion by the fungus during the ripening of the seed, and seed-treatment with a standard disinfectant, of which germisan and uspulun-universal (six hours' immersion) may be specially recommended. Two applications of 2 per cent. Bordeaux mixture gave particularly good results in bad years, the average weight of the produce of the sprayed plants of Amager Market in 1927 being 824 gm. compared with 505 gm. for the untreated control.

Phoma apiicola, the agent of celery scab [ibid., xiii, p. 73], has been isolated on a few occasions from diseased roots. *P. rostrupii* [ibid., vii, p. 701] was isolated from a sample of carrot seed and inoculated into roots and stems with positive results, producing on the former a sunken, brownish-black rot, and on the latter water-soaked, brownish-green spots or stripes up to several cm. in length. During the summer infection spread extensively by means of the conidia, with the result that the umbels wilted, turned brown, and shrivelled before the seed reached maturity ; the average incidence of infection in five samples each of 100 seeds was 16 per cent. Some years ago the decay caused by *P. rostrupii* was responsible for such heavy losses in Denmark that in certain localities the growing of carrots for seed had to be entirely abandoned. A considerable improvement, however, has been effected by replacing the practice of raising the plants for seed from transplanted roots by that of planting out the latter directly in the field and allowing them to overwinter there.

Alternaria radicina [ibid., xiii, p. 354] was isolated from a sample of carrot seed in 1927 and on inoculation into carrot roots produced

a deep, black rot of the wet type. Seedlings from infected seed may be killed by the fungus, which on the leaves and petioles of older plants forms dry spots or stripes; from the base of the petiole the mycelium spreads to the upper part of the root.

The examination of a sample of English peas on the germinator revealed 18 per cent. infection by *Ascochyta pisi* [ibid., xiii, p. 611]; the germination percentage of this material was 75, and 11 per cent. of the resulting seedlings showed the presence of the organism on the leaves or stems. Seed disinfection with uspulun-universal proved only moderately effective.

A greenhouse test in 1926 showed that bean seeds heavily spotted over the surface from infection with anthracnose (*Colletotrichum lindemuthianum*) may actually germinate better than those bearing only an inconspicuous lesion close to the hilum. In addition to seed selection, disinfection with uspulun-universal (3 to 6 hours' immersion in a 0·5 per cent. solution) was found to give a measure of control of anthracnose, which cannot, however, be entirely eliminated by either method. The results of spraying tests have been generally unsatisfactory, and the prospects of breeding for immunity from the disease do not seem very hopeful. The well-known susceptibility of the Wax groups of *Phaseolus vulgaris* was exemplified in a varietal trial at Lyngby in 1916.

IKATA (S.). **Studies on red spot disease (chocolate spot disease) of Vicia faba.**—*Rept. Agric. Exper. Stat. Okayamaken, Extra No.* 38, 28 pp., 5 pl., 5 figs., 1933. (Japanese.) [Abs. in *Japanese Journ. of Botany*, vii, 1–2, p. (6), 1934.]

The reddish-brown, circular spotting of the leaves and streaking of the stems of broad bean (*Vicia faba*), usually attributed to a pathogenic bacterium [*Bacillus lathyri*: *R.A.M.*, xiii, p. 492], has been found by the writer's investigations in Japan to be due to *Botrytis fabae* n. sp., a species allied to *B. cinerea* [but see *B. fabae* Sardiña: ibid., ix, p. 424; xi, p. 346]. It is thought probable that the new fungus may be also in part responsible for the streak or chocolate spot disease in England. *B. fabae* exerts a very virulent pathogenic action on *V. faba*, being apparently restricted to this host among the Leguminosae. Sclerotia are formed on the stems and petioles during the summer and conidia produced continuously from November to March. The fungus enters the host through the epidermal cells, not by way of the stomata.

SMITH (K. M.). **The mosaic disease of Sugar-Beet and related plants.**—*Journ. Min. Agric.*, xli, 3, pp. 269–274, 4 figs., 1934.

In this paper the author gives an account, based partly upon the researches of other workers, but mainly upon his own work carried out at Cambridge, of mosaic disease of sugar beet and its manner of spread. There is no evidence that more than one virus is concerned, the slightly different symptom-expressions exhibited being probably all due to one agent. The virus is transmissible to all varieties of beet and also to spinach. In Russia *Chenopodium album* and *Amaranthus retroflexus* are affected [*R.A.M.*, xi, p. 90]. In the British Isles *C. album* (to which the author experimentally

transmitted the virus) is a very common weed and is frequently infested by the insect vector of beet mosaic, *Aphis rumicis*. The virus was experimentally transmitted by means of this vector as well as by *Myzus persicae*, and was readily transmitted to healthy beet seedlings and *C. album* by the ordinary laboratory method of rubbing the leaves with a pestle dipped in the sap of an affected plant.

VERPLANCKE (G.). **Etude comparative de glomérules de Betteraves.** [A comparative study of Beetroot seed-clusters.]—*La Sucrerie Belge*, liii, 19, pp. 361–377 ; 20, pp. 385–392, 1 fig., 8 graphs, 1934.

According to Miss Doyer, beetroot seed-clusters are generally heavily infected by *Phoma betae* in Holland [*R.A.M.*, ix, p. 665 ; see also xiii, p. 417], but in a recent examination of 20 commercial Belgian varieties, six showed no external trace of infection until after 15 days in the germinator. The pycnidia of the fungus were subsequently detected in the alveoli containing the seeds, which are not accessible to a disinfectant. It is concluded, therefore, that the presence of pycnidia on the exterior of the clusters is not a reliable criterion of infection. Conflicting results were also obtained in experiments with various fungicides, of which germisan may be mentioned as definitely invigorating the plants and generally reducing the incidence of infection, though in the case of one variety sulphuric acid proved greatly superior. It is considered urgently necessary to secure a higher degree of uniformity in the methods used for the examination of beetroot clusters from a germinative standpoint. *P. betae* was found to be responsible for most, if not all, of the gaps in the seedling stands.

SCHMIDT (E. W.). **Ueber den Wurzelbrand der Rüben. Eine kritische Betrachtung.** [On the root rot of Beets. A critical symposium.]—*Deutsche Zuckerind.*, lix, 26, pp. 520–521, 1934.

Discussing current theories concerning the etiology of beetroot rot, the writer points out that *Phoma betae* [see preceding abstract] is regularly present on ordinary commercial seed to the extent of 40 to 100 per cent., its prevalence being in general directly proportionate to the humidity of the climate of origin. *Pythium de Baryanum* and *Aphanomyces levis*, on the other hand, are strictly confined to the soil. In recent tests at the Kleinwanzleben sugar factory experiment station, no difference was observed between heavily inoculated and uninoculated seed as regards the incidence of disease in the resultant seedlings, showing that the latter must develop a certain measure of receptivity before infection can take place. It was further ascertained by experiments that *P. betae* cannot subsist in the soil either on twine impregnated with beet juice or on ground seed-clusters, whereas it remained viable for ten months on thick stems. The removal of the latter from the field is therefore of the utmost importance in combating the disease. In the circumstances seed disinfection can only afford partial control, which is considered, however, to be well worth while as its approximate cost is only M. 1 per acre.

Meyer-Hermann (K.). **Erfolgreiche Bekämpfung der Herz- und Trockenfäule der Rübe durch Borax.** [The successful control of heart and dry rot of the Beet by borax.]—*Pflanzenbau*, xi, 1, pp. 24–28, 1934.

Excellent results have been obtained in large-scale experiments at the Harleshausen (Germany) Plant Protection Station in the control of heart and dry rot of beets by the application of coarse borax salt to the soil at the rate of 10 to 20 kg. per hect. [*R.A.M.*, xiii, p. 610]. This substance, which only costs M. 0·27 to 0·33 per kg., increased the sugar content of a treated beet plot from 19·6 to 21·2 per cent. when applied at the rate of 10 kg. per hect., the dry weight being simultaneously raised from 26·94 to 29·24 per cent. With heavier doses of borax (up to 40 kg. per hect.) there was a gradual decline both in sugar content and dry weight. In its present commercial form borax is readily miscible with 40 per cent. potash salt which facilitates its application to the soil. It is recommended that the appropriate quantity of borax (not below 10 or over 20 kg.) be thoroughly mixed with 1 doppelzenter potash remaining from the basic fertilizer and the whole strewn over the soil immediately before or after drilling.

Foëx (E.). **Maladie du coeur de la Betterave.** [Beetroot heart rot.]—*Journ. d'Agric. Prat.*, N.S., xcviii, 26, pp. 518–520, 1934.

The conclusions of Gäumann [*R.A.M.*, ix, p. 757], Brandenburg [ibid., xii, p. 2], Bobko and Belvoussov [ibid., xiii, p. 72], and Marchal [ibid., ix, p. 152] with regard to the etiology and control of heart rot of beet (associated in part with *Phoma betae* and also with boron deficiency) [see preceding and next abstracts] are summarized.

Nowotnówna (Anna). **The influence of boron upon the growth of Sugar Beets.**—*Gaz. Cukrownicza*, lxxiv, pp. 104–108, 1934. [Abs. in *Chem. Abstracts*, xxviii, 16, p. 5100, 1934.]

Sugar beets [in Poland] grown under conditions of boron deficiency [see preceding abstracts] were found to succumb readily to dry rot of the leaves. The optimum quantity of boron for growth and sugar content was determined as 0·1 gm. per pot, normal development being observed with 0·025 to 0·40 gm. borax per 36 kg. sand. Larger amounts cause abnormal chlorophyll formation and starch accumulation in the foliage, but in time the plants adapt themselves even to quantities up to 1·6 gm. per pot with little resultant deficiency in sugar content and weight.

Liro (I.). **Finland: the Onion smut.**—*Internat. Bull. of Plant. Protect.*, viii, 7, pp. 150–151, 1934.

In Persoon's herbarium at Leyden, Holland, the writer detected a specimen of *Tuburcinia* [*Urocystis*] *cepulae* [*R.A.M.*, xiii, pp. 288, 614] on onion, the label being inscribed by Persoon (probably, from the writing, at an advanced age, *c.* 1834) as ? *Uredo cepae*. Persoon having died while practising medicine in Paris, the fungus may reasonably be supposed to have originated in that city or its environs. This discovery is considered to prove that *U. cepulae*,

hitherto regarded as a North American species, actually comes from Europe, whence it was long ago introduced into the New World, possibly by French emigrants.

JØRSTAD (I.). **Melding om plantesykdommer i land- og hagebruket. VIII. Sykdommer på Tomater og Agurkvekster.** [Report on plant diseases in agriculture and horticulture. VIII. Tomato and Cucumber diseases.]—Reprinted from *Landbruksdirektørens Årsmelding, Tillegg* C, 55 pp., 1934.

Notes are given on the symptoms, etiology, and control of a number of well-known fungous, virus, and physiological diseases of tomatoes and Cucurbitaceae in Norway observed during the period from 1928–33 [cf. *R.A.M.*, vii, pp. 700–1].

NICOLAS (G.) & AGGÉRY (Mlle). **Observations sur un parasite de Citrullus vulgaris Schrader.** [Notes on a parasite of *Citrullus vulgaris* Schrader.]—*Bull. Soc. Myc. de France*, l, 1, pp. 115–119, 2 figs., 1934.

This is a slightly expanded version of the authors' note on the taxonomy of *Gloeosporium lagenarium* on watermelon in France, which has already been noticed from another source [*R.A.M.*, xii, p. 417].

BENLLOCH (M.) & DOMINGUEZ (F.). **La enfermedad de los Pimentales en Aldeanueva del Camino.** [The disease of Chillies in Aldeanueva del Camino.]—*Bol. Pat. Veg. y Ent. Agric.*, vii, 27–30, pp. 1–20, 10 figs., 1934.

This is a progress report of the investigation, started in 1931, of the deterioration of chilli pepper [*Capsicum annuum*] mentioned in a previous communication [*R.A.M.*, xii, p. 354], which is stated to have become increasingly threatening to the cultivation of the crop in the province of Caceres, Spain, where peppers are said to be one of the chief dietary items of the local peasantry. The deterioration was shown to include three different diseases, the first of which, locally known as 'seca' [withering], was found to be caused by an unidentified species of *Fusarium* of the *Martiella* section. It is characterized by the sudden wilting of adult plants, rapidly causing death, which always occurs during the hottest period of the season, chiefly after a heavy rain. There were indications that it is most severe in soils tending towards acidity, for which reason sufficient liming to render them alkaline is recommended as a possible measure of control, coupled with adequate crop rotation. In contaminated soils it is believed that the occurrence of the trouble may be prevented by spraying the plants around the collars with a mixture composed of 75 gm. copper carbonate, 750 c.c. ammonia, and 100 l. water.

The other two conditions, respectively known locally as 'niebla vieja' [old blight] and 'niebla nueva' [new blight], appear to be caused by filterable virus agencies [cf. ibid., xi, pp. 226, 431], especially the second which presents features characteristic of diseases of the mosaic group, and is apparently transmitted in the field by aphids. It is the more important of the two, and may manifest itself at any stage in the development of the plants,

which are markedly stunted and retarded in their growth, and remain sterile or produce deformed and dwarfed fruit. The 'niebla vieja', on the other hand, is chiefly characterized by the defoliation of the apical portions of the shoots, while the leaves lower down show no lesions apart from a certain loss of turgidity. In some cases, however, the stems and fruit stalks may be covered with more or less abundant greyish spots, occasionally with whitish centres. The root system of affected plants is always normal. Attempts to transmit tobacco mosaic to chilli plants from tobacco fields in the neighbourhood gave negative results. Observations indicated that the 'niebla nueva' caused less damage on heavy soils with a high content in iron and magnesium, and experiments are in hand to establish whether the disease may be minimized by the addition of these elements to the soil.

Sardiña (J. R.) & Landaluce (P. U.). **La podredumbre de la raíz de la Viña.** [Root rot of the Vine.]—*Bol. Pat. Veg. y Ent. Agric.*, vii, 27–30, pp. 208–216, 5 figs., 1934.

An official investigation in December, 1931, of a serious root rot of the vine prevalent in the Lugo province of Galicia, Spain, showed that it was caused by *Armillaria mellea* [*R.A.M.*, ix, p. 360], which is stated also to inflict serious injury on fruit trees both in Galicia and in all the humid and semi-humid regions of Spain. A brief description is given of the rot of the vine roots, the distinguishing features of which are compared in a table with those caused by *Rosellinia necatrix* [loc. cit.], and a popular account is appended of the morphology of *A. mellea*.

Control of the rot can only be effected by preventive measures, such as the extirpation and destruction by fire of all infected material in the vineyard, deep cultivation of the soil, drainage of the holes in which the vines are planted with stones placed at the bottom, instead of wood blocks, as is the usual custom in Galicia, the use of absolutely healthy planting stock, and the avoidance of insufficiently matured stable manure, which should be preferably replaced by well-balanced mineral fertilizers.

Jacquemain (R.) & Gravier. **Note sur deux spécialités anti-cryptogamiques.** [A note on two proprietary brands of fungicides.]—*Comptes rendus Congrès Soc. Savantes Paris et Départements 1932, Section des Sciences*, pp. 293–294, 1932. [Received June, 1934.]

Complete control of vine mildew [*Plasmopara viticola*] and *Oidium* [*Uncinula necator*] was obtained at Besançon by the simultaneous application on 13th June and 7th and 31st July, 1931, of bouisol and sulsol, of which the former is designed to replace Bordeaux mixture and the latter sulphur [*R.A.M.*, xi, p. 587; xii, p. 199; xiii, p. 121]. The composition of bouisol is given as 22 per cent. copper oxychloride, 50 per cent. water, and 28 per cent. of an organic complex; and that of sulsol as 40 per cent. very finely triturated sulphur in suspension, 44 per cent. water, and 16 per cent. of the above-mentioned organic complex. Both diseases attacked the vines of a neighbouring plot treated with Bordeaux mixture and sulphur.

RAVAZ (L.). **Un nouveau parasite de la Vigne en Algérie.** [A new parasite of the Vine in Algeria.]—*Prog. Agric. et Vitic.*, ci, 18, p. 430, 1934.

This is a brief report of what is believed to be the first record in the neighbourhood of Algiers in the spring of 1934 of a decay of young vine shoots, associated with a wilt and the presence on them of an unidentified external, white mycelium, interspersed with sclerotia 2 to 5 mm. in diameter, hyaline on the surface but faintly yellowish internally. The trouble was chiefly observed attacking the lower shoots of stocks on soil that had been flooded for some days [see next abstract].

A. (P.). **Pourriture blanche des rameaux de Vigne.** [White rot of Vine shoots.]—*Prog. Agric. et Vitic.*, ci, 20, pp. 471–472, 1934.

The author states that the decay of young vine shoots recently reported from the neighbourhood of Algiers [see preceding abstract] has been known to occur in many localities of the department of Algiers for some considerable time, and in 1923 it caused localized damage in the region. The trouble is caused by *Sclerotinia libertiana* [*S. sclerotiorum*] which, under conditions of high humidity, rapidly penetrates and rots the tissues of young vine shoots, especially towards their apex; occasionally, however, infection starts at the base of the shoots, which then easily break off. The disease only occurs during more or less prolonged spells of wet weather, and its progress is rapidly checked on the return of dry weather. In 1934 many affected shoots were found on stocks that had received two sprayings with Bordeaux mixture against mildew [*Plasmopara viticola*], a fact which is considered to indicate that the disease is not amenable to control by Bordeaux mixtures of the strengths usually employed.

WALLACE (G. B.). **Report of the Mycologist, 1933.**—*Ann. Rept. Dept. of Agric. Tanganyika Territory, 1933*, pp. 76–78, 1934.

During the period under review cashew nut (*Anacardium occidentale*) seedlings in Tanganyika developed angular leaf spots and stem lesions resembling those produced on mangoes by *Bacillus mangiferae* [*R.A.M.*, xi, p. 793]. Long smut of sorghum [*Tolyposporium ehrenbergii*: ibid., xiii, p. 300] was widely distributed but not frequent in the Shinyana district, and was found also at Mkuyuni. In the former locality the commonest sorghum smut was grain smut [*Sphacelotheca sorghi*: ibid., xii, p. 552], the native mixed varieties showing 8 to 43 (average 25) per cent. infection. A very common parasite of young sorghum in Tanganyika is *Ascochyta sorghina*, which produces long, grey, dead areas on the leaves; older plants do not become infected and do not suffer from the attack sustained while young. *Diplodia macrospora* caused a leaf spot of maize [ibid., xii, pp. 201, 552]. From an orange showing a large, dry, leathery, dark brown area with a minute puncture at the centre the following fungi (identified at the Imperial Mycological Institute) were isolated: *Phytophthora palmivora*, *Colletotrichum gloeosporioides*, and a species of *Polyopeus*, a

genus not before recorded on citrus. All early plantings of cowpeas and other leguminous crops at Mwanza were badly attacked by virus disease in April and May, though the February plantings remained unaffected. The resistance to rosette disease shown by Basse and Philippine White groundnuts in West Africa [ibid., xi, p. 697; xii, pp. 5, 143] was not maintained in Tanganyika. Leaf curl of sesame [ibid., xii, p. 552] was less severe at Morogoro than in 1932, and was present also on Mafia Island. The affected leaves bore enations similar to those seen in tobacco leaf curl [ibid., xii, p. 475], which may indicate that the diseases are related.

Botany.—*Forty-sixth Ann. Rept. Georgia Exper. Stat. for the year 1933-34*, pp. 26–29, 1934.

It was found, in confirmation of previous tests, that the agent of peach rosette [*R.A.M.*, xiii, p. 384] behaves like a low-temperature organism.

Work has been in progress since 1931 on the development of a groundnut variety combining the desirable characters of the Spanish with resistance to *Cercospora* leaf spots [*C. arachidicola* and *C. personata*: ibid., xiii, p. 74] and *Sclerotium rolfsii*. Eighty varieties and strains are being grown at two stations with this object in view, and the selections at present available include upwards of 200 prolific plants of apparently satisfactory reaction to both diseases.

Two years' observations on the precautions necessary to ensure the production of high-grade tomato plants in south Georgia indicated that seed disinfection is fully as important as spraying for this end, and prominence is now being given to the former mode of treatment.

Adam (D. B.) & Pugsley (A. T.). **Bacterial plant diseases in Victoria.**—*Journ. Dept. Agric., Victoria*, xxxii, 6, pp. 304-311, 323, 8 figs., 1934.

In 1933, stocks (*Matthiola incana*), especially of the Queen Alexandra variety, were attacked in Victoria by a disease which rendered the flowers commercially useless. Dark greyish-green, water-soaked lesions appeared on the stems and flower stalks and later turned brown, the cortex tending to split. Leaf spotting accompanied by yellowing of the leaf tips was occasionally present, but many affected plants showed stem lesions and leaf yellowing only. The causal organism (which appears to differ in certain respects from those described on the same host as *Phytomonas* [*Pseudomonas*] *campestris* and *P.* [*Bacterium*] *matthiolae* [*R.A.M.*, xiii, p. 306]) was a Gram-negative, motile rod, approximately 1·7 to 3·4 by 0·7 μ, which on beef extract agar produced smooth, white, glistening colonies in 48 hours at 27° C., had a positive diastatic action on starch agar, grew abundantly in Fermi's solution, liquefied gelatine, caused litmus milk to become alkaline at the top and decolorized at the bottom, produced acid but no gas from glucose and saccharose but not from lactose in peptone-free media, and did not produce indol or reduce nitrates. Its pathogenicity was established by needle inoculations near the top

of the stem, which caused the development of water-soaked areas in 5 to 7 days.

Oleanders (*Nerium oleander*) near Melbourne showed cream-coloured, later brown to black, spots often surrounded by a yellow halo on the leaves, on the upper (and occasionally on the lower) surface of which they usually developed into small warts. Infection of the midrib was common, starting as a water-soaked, elongated area developing into a brown or black canker. The overgrowth of the midrib at the points of infection caused the leaf to bend over sharply towards the stem. When infected on emergence the young leaves were malformed and distorted. Young infected stems showed dark, elongated, slightly swollen areas, while later the epidermis split, the lesions persisting as cankers on the old wood, similar cankers developing on the peduncles. Infected young pods remained short, thick, malformed, and partly covered with necrotic black patches. On older pods small warts developed. The causal organism was a motile, Gram-negative rod approximately 1·2 to 2 by 0·4 μ which formed small, moist, smooth, circular, white colonies and was determined as *Phytomonas tonellianum* (Ferraris) n. comb. [*Bact. tonellianum* Ferraris: Trattato di Patologia, &c., i, p. 104; syn. *Pseudomonas savastanoi* var. *nerii*: *R.A.M.*, v, p. 173; xi, p. 698.]

Notes are also given on mulberry blight (*Bact. mori*) [ibid., xii, p. 271], French bean (*Phaseolus vulgaris*) wilt (*Bact. flaccumfaciens*) [ibid., xii, p. 71], walnut blight (*Bact. juglandis*) [ibid., xii, pp. 338, 339], crown gall of stone fruit trees (*Phytomonas* [*Bact.*] *tumefaciens*) [ibid., xii, p. 516], and lemon black pit (*P.* [*Pseudomonas*] *syringae*) [ibid., viii, p. 423; xii, p. 376].

Burnet (F. M.). **The bacteriophages.**—*Biol. Reviews*, ix, 3, pp. 332–350, 1 graph, 1934.

After summarizing the present position of the bacteriophage problem as shown in contemporary literature [*R.A.M.*, xiii, p. 589], the writer reaches the following main conclusions. Bacteriophages may be regarded as a class of diverse micro-organisms with a common ability to parasitize or live in symbiosis with bacteria. They show about the same range of size and many of the functional characteristics of the viruses associated parasitically or symbiotically with animals and higher plants, especially the incapacity to multiply in the absence of living cells. The bacteriophages present all the typical attributes of biological evolution, including wide diversity of size, functional activity, and chemical (antigenic) structure, accompanied by a clear tendency to segregation into distinct species within which only minor variations occur. Specific differentiation among the bacteriophages appears to be about as distinct as in bacteria, while as regards 'pathogenicity' there are many analogies between the two groups of organisms. Thus, in both it is found that some are restricted to a single host while others are able to attack a wide range of species, and just as bacterial strains vary in virulence, some phages are highly destructive to the susceptible bacterium whereas others show all grades of diminishing intensity of lysis until the permanent phage-bacterium symbiosis characteristic of certain bacteria is reached.

Koudelka. **Neue Probleme in der Brandpilzfrage.** [New problems in the smut question.]—*Nachricht. über Schädlingsbekämpf.*, ix, 2, pp. 100–104, 2 figs., 1934.

In this paper, reprinted from *Blätter für Pflanzenbau u. Pflanzenzücht* Tetschen a.d. Elbe, xi, pp. 27–31, 1934, inoculation experiments with *Ustilago tragopogonis* from *Tragopogon* on cereal seed-grain at Tetschen a.d. Elbe [Czecho-Slovakia] are described, which resulted in a reduction of germination, especially in barley. Seedlings from the inoculated seed-grain were considerably retarded in growth. Similar effects followed infection by *U. scorzonerae* from *Scorzonera humilis* [*R.A.M.*, xii, p. 88]. A reddish discoloration frequently characterized the diseased plants, which further reacted to the attacks of the smuts by profuse tillering; in rye the tillers averaged more than three times as many as in the uninoculated controls but were often much stunted and arrested in development. 'White ear' of oats [cf. ibid., x, p. 490] also appears to result from latent infection by these species. In the author's cultures of these two smuts, smut spores (chlamydospores) were formed, this being apparently the first report of their occurrence in culture. The fungi would thus be capable of completing their entire life-cycle, up to and including smut spore formation, in a saprophytic state in the soil without the aid of a living host.

Enomoto (S.). **On the rest period and its shortening in smut spores (preliminary report.)**—*Trans. Sapporo Nat. Hist. Soc.*, xiii, 3, pp. 167–172, 1934.

The writer's experiments [the results of which are tabulated and briefly discussed] showed that the fresh spores of *Ustilago tritici*, *U. avenae*, *U. nuda*, *U. grandis* [*R.A.M.*, iv, p. 499], *U. zeae*, and *U. hordei* germinate less readily than those kept at room temperature for several days, indicating that a period of after-ripening is beneficial for the process. A highly stimulatory action on the germination of the above-mentioned smuts (except *U. hordei*, which was not included in the test) and *Sorosporium* [*U.*] *panicimiliacei* [ibid., xi, p. 566; xii, p. 616] was exerted by ether (20 hours' exposure to 0·3 to 0·5 c.c. per l. of space in a sealed glass jar) [ibid., iii, p. 742].

Hewlett (C. H.) & Hewlett (J. H.). **Hot-water treatment of seed of Barley and Wheat.**—*New Zealand Journ. of Agric.*, xlix, 1, pp. 37–41, 1934.

Tables are given showing the quality and quantity of the crops obtained during the period 1930–4, inclusive, in the Canterbury district of New Zealand, from untreated barley seed and seed subjected to the hot water treatment against smut [*Ustilago hordei* and *U. nuda*: *R.A.M.*, xiii, p. 24]. The loss sustained through growers sowing their own seed was again apparent in 1934, though the number doing so has appreciably diminished.

In 1934, when the hot water treatment of barley seed was introduced into the locality, wheat seed similarly treated against smut [*U. tritici*: ibid., iv, p. 533; v, p. 84] was sown on the Canterbury Seed Company's farms. Since then an increasing amount of wheat seed has been treated annually and the product distributed among

growers. In 1931 wheat seed certification [ibid., vii, p. 571] was limited to crops grown from hot water treated pure strains. In the last few years the incidence of *U. tritici* has greatly diminished locally and the disease is now a comparatively minor source of anxiety [cf. ibid., vi, p. 678; vii, p. 224]; the wheat yield has also steadily increased.

ZALESSKY (V. K.) & WASJUTA (O. N.). **On the means of fighting with Ustilago tritici.**—*Microbiol.*, Moscow-Leningrad, ii, 2, pp. 155–161, 1933. (Russian.) [Abs. in *Bot. Centralbl.*, N.F., xxv, 1–2, pp. 55–56, 1934.]

In an attempt to diagnose the presence of loose smut of wheat (*Ustilago tritici*) by the physiological characters of the seed-grain, dullness (loss of gloss) was found to be of uncertain value as a criterion. A definite correlation was observed, however, between dullness and decline of specific gravity and when the seed-grain was floated in chloroform, and alcohol added until it separated into two layers, the upper consisted of the infected grains. The method also proved applicable to barley infected by loose smut [*U. nuda*], the mycelium of which could be detected by microscopic examination in all the floating seeds.

Further experiments showed a higher enzymatic activity in the diseased than in healthy wheat seed-grain, the respiratory energy of the former in the early stages of germination exceeding that of the latter by 1·2 to 1·5 per cent.

GASSNER (G.) & KIRCHHOFF (H.). **Versuche zur Bekämpfung des Weizenflugbrandes mittels Benetzungsbeize. II. Mitteilung.** [Experiments in the control of loose smut of Wheat by moistening. Note II.]—*Phytopath. Zeitschr.*, vii, 3, pp. 271–284, 1 graph, 1934.

Whereas in previous experiments in the control of loose smut of wheat [*Ustilago tritici*] by moistening in closed vessels [*R.A.M.*, xiii, p. 293], the moistened seed-grain (Santa Fé) was immediately exposed to the high steeping temperature of 50° C., in the present series (1933–4) the sterilization was preceded by pre-soaking at room temperature for varying periods up to four hours. At the same time the steeping temperature was adjusted to a range of 50° to 56°, the amount of water used varied from 4 to 6 l., and the disinfection period from ¼ to 4 hours; isopropyl alcohol (2 per cent.) or methylated spirit (3 per cent.) was added to the water.

The results of the earlier series of tests were fully substantiated as regards the effects of the temperature and quantity of the steeping water and the increase in efficiency resulting from the addition of alcohol. The pre-soaking also increased the efficiency of the process, and by this coupled with the use of alcohol it was found possible to reduce the entire period of treatment to between three and four hours; of this time, not less than one hour should be spent on the actual hot water disinfection. Within these limits, the longer the pre-soaking, the less will be the injury to germination and the more efficacious the subsequent disinfection against loose smut.

In supplementary trials with the General von Stocken and

Salzmünder Standard winter wheat varieties an explanation was sought for the fact that short periods of pre-soaking render the seed-grain more sensitive to high temperature than long ones (up to 24 hours in the case of the former and up to 16 in that of the latter variety). It was found that injury to germination varies directly with the water content of the embryo, which falls with an increase in the pre-soaking period owing to the transference of the absorbed moisture from the embryo to the endosperm.

Neill (J. C.). **Seed treatments for Wheat, Barley and Oats.**—*New Zealand Journ. of Agric.*, xlix, 1, pp. 43–45, 1934.

After discussing the advantages and disadvantages of various commonly used seed disinfectant treatments against the smuts [*Ustilago* and *Tilletia* spp.] of wheat, barley, and oats (other than those controllable only by hot water), the author gives notes on the following treatments, arranged in descending order of preference: organic mercury dusts, copper carbonate and copper oxychloride dusts [*R.A.M.*, xi, p. 566], formalin steep and sprinkle, and copper sulphate steep and sprinkle. The cost of the materials and the method of application are indicated in each case.

Nieves (R.), Barraza (J. A.), & Horovitz (N.). **Estudios sobre la distribución y prevalencia relativa de la Tilletia tritici y Tilletia levis, en el sudeste de La Pampa, en 1932.** [Studies on the distribution and relative prevalence of *Tilletia tritici* and *Tilletia levis* in the south-east of La Pampa in 1932.]—*Bol. Mens. Min. Agric. Nac.*, Buenos Aires, xxxv, 1–3, pp. 79–101, 1933. [Received October, 1934.]

A fully tabulated account is given of the writers' studies on the distribution and relative prevalence of *Tilletia tritici* and *T. levis* [*T. caries* and *T. foetens*] on wheat in the south-east of La Pampa, Argentine Republic, during the agricultural season of 1932–3 [*R.A.M.*, xii, p. 682]. Of the 500 samples examined, 330 (66 per cent.) showed bunt infection, due in 229 cases to *T. caries*, in 83 to *T. foetens*, and in 18 to both species, corresponding to a relative frequency of 71 per cent. for the former. Of the 66 per cent. diseased samples, 36·4 per cent. showed merely traces of bunt, 10·4 per cent. an 'average' incidence, and 1 per cent. a fair number of infected grains; in these the grain was sold without any deduction for smut prevalence. In the remaining 18·2 per cent. the heavily smutted product was subjected to a discount varying from 50 centavos to 2 pesos [1 peso = 3s. 11½d. at par] per quintal [1·9684 cwt.].

Wismer (C. A.). **Inheritance of resistance to bunt and leaf rust in the Wheat cross, Oro x Tenmarq.**—*Phytopath.*, xxiv, 7, pp. 762–779, 3 graphs, 1934.

The results [which are fully described and tabulated] of a study at the Kansas Agricultural Experiment Station on the inheritance of resistance to bunt (*Tilletia levis*) [*T. foetens*: *R.A.M.*, xiii, p. 85] in the F_2, F_3, and F_4 generations of the wheat cross, Oro (resistant) × Tenmarq (susceptible), indicate that a high degree of susceptibility

to the disease is recessive. Some of the F_4 lines showed greater resistance to bunt than Oro, denoting that Tenmarq (a cross between a hard red winter Crimean wheat, similar to Kanred, and Marquis) may also carry one or more factors for resistance to the disease. Multiple factors are thought to be probably responsible for the inheritance of resistance to bunt in this cross. When inoculated with a composite of Kansas bunt forms, Oro develops an average of 5 per cent. infection and Tenmarq 57 per cent. The correlation coefficient of $r = 0{\cdot}8875 \pm 0{\cdot}0106$ between the reaction of the hybrid selections to physiologic form 1 and that of the same selections to a composite of Kansas bunt collections is very high.

Transgressive segregation was observed in a study of leaf [brown] rust (*Puccinia triticina*) [ibid., xiii, p. 567] reaction in the progeny of this cross, indicating that both parents probably contain factors for resistance to the rust. No correlation was detected between bunt and brown rust infection. A bunt-resistant variety of considerable agricultural value may be yielded by further selection, since a number of the row selections from this cross in 1932 and 1933 appeared to combine the desirable qualities of both parents.

Yu (T. F.), Chen (H. K.), & Hwang (L.). **Varietal resistance and susceptibility of Wheats to flag smut (Urocystis tritici Koern.) II.**—*Agric. Sinica*, i, 3, pp. 79–81, 1934. [Chinese summary.]

A fully tabulated account is given of experiments conducted at Nanking, China, from 1925–33, inclusive, on the reaction to flag smut (*Urocystis tritici*) of 3,479 wheat strains from the provinces of Shantung, Honan, and Kiangsu [*R.A.M.*, xiii, p. 19]. Throughout the eight-year period 72 of the selections tested showed a high degree of resistance to the disease as compared with the susceptible controls, coupled with a satisfactory habit of growth. Fifty-five of these resistant strains are now undergoing tests for yield, early maturity, and reaction to flag smut collections from regions at a distance from Nanking.

Steiner (H.). **Ein Beitrag zur Frage der Getreiderostbekämpfung auf kulturellem Wege.** [A contribution to the question of cereal rust control by cultural methods.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliv, 7, pp. 348–354, 1934.

The writer discusses in general terms the possibilities of combating cereal rusts (*Puccinia triticina*, *P. glumarum*, and *P. graminis* on wheat and *P. dispersa* [*P. secalina*] on rye) in Austria [*R.A.M.*, xiii, p. 292] by cultural methods, e.g., adjustment of sowing dates to avoid exposure of the plants to infection during critical periods, and the destruction of the usually heavily infested volunteer plants. The conclusion is reached that such means may form a valuable adjunct to the work of breeding for immunity, the latter, however, remaining indispensable to the final solution of the rust problem.

Stakman (E. C.), Levine (M. N.), Cotter (R. U.), & Hines (L.) **Relation of Barberry to the origin and persistence of physiologic forms of Puccinia graminis.**—*Journ. Agric. Res.*, xlviii, 11, pp. 953–969, 3 maps, 1934.

This is a summarized account of the results obtained by the authors up to date in their studies of the part played by barberries in the United States in the production and perpetuation of physiologic forms of *Puccinia graminis* in nature, some preliminary information on which has been published in a previous communication [*R.A.M.*, xi, p. 437]. Of the 675 accidial collections tested on wheat, rye, and oats, 281 caused infection, of which 34·2 per cent proved to be of the *tritici*, 63·7 per cent. of the *secalis*, and 2·1 per cent. of the *avenae* variety, the relative prevalence of the varieties being probably largely governed by the distribution of wild grasses susceptible to them. Of 138 uredospore collections of the rust obtained within 100 yds. from rusted barberries, 52·2 per cent. were *tritici*, 32·6 *secalis*, and 15·2 per cent. *avenae*, this distribution having probably been partly influenced by the conscious selection of hosts known to be susceptible to certain rust varieties. The results of the investigation, supported by other observations, would indicate that stem [black] rust of rye (*P. g. secalis*) is almost entirely dependent on barberries for its persistence in the United States.

While the identification of 94 aecidial collections of *P. g. tritici* showed the presence of 26 physiologic forms (i.e., a different form for approximately every four collections), only one different form was isolated from about every 100 uredo collections out of a total of about 8,000 made at random during a number of years. Of these forms, 36 and 38 were the most prevalent; forms 62, 102, 104, and 105 were only isolated from rusted barberries. From 71 uredospore collections of black wheat rust made close to barberry bushes, isolations gave 19 physiologic forms, one of which (form 48) has never been found elsewhere in the United States, although it has been reported several times from Canada.

Nine physiologic forms of *P. g. secalis* were isolated from 27 aecidial collections, and 8 forms from 28 uredospore collections made in the vicinity of rusted barberry bushes, while uredospore collections made at random yielded a considerably smaller proportion of physiologic forms to the total number of collections. The most prevalent forms were 7 and 11; form 14 was only isolated from aecidial collections.

The six aecidial collections of *P. g. avenae* that were identified consisted of forms 2 and 5, both of which are widely distributed in the United States. A new form (10) was isolated from oats near rusted barberries; it is far more virulent on the Richland groups of oat varieties than the two other forms.

In greenhouse inoculations of barberry with teleutospore material, the ratio between the number of teleutospore collections used and the number of physiologic forms subsequently isolated was 4·83 to 1 for *P. g. secalis*, and 1·76 to 1 for *P. g. tritici*; the latter forms included 67, 96, and 127 which were never obtained from uredospore material in the field, and another form (101) which was only found in the United States on artificially inoculated

barberries, but was isolated from uredospore material collected in Bulgaria.

The above results are considered to indicate that barberry is important in the production and persistence in nature of physiologic forms of *P. graminis*, especially the *secalis* variety, and probably also of *P. g. agrostidis* and *P. g. poae*.

HASSEBRAUK (K.). **Die Bedeutung der Bodenfeuchtigkeit für das Verhalten von Puccinia graminis und Puccinia triticina auf verschiedenen Weizensorten** [The importance of soil moisture in the behaviour of *Puccinia graminis* and *Puccinia triticina* on different Wheat varieties.]—*Phytopath. Zeitschr.*, vii, 3, pp. 259–269, 1934.

A tabulated account is given of the writer's inoculation experiments at the Brunswick Institute of Agricultural Botany with *Puccinia triticina* and *P. graminis* on seedlings of a number of different wheat varieties in rich garden soil adjusted to 25, 50, and 75 per cent. of its water-holding capacity [*R.A.M.*, xiii, p. 83].

With *P. graminis* enhanced resistance developed, almost without exception, parallel with an increasing water content, and at 75 per cent. there was an access of chlorosis and a diminution of pustule numbers; the incubation period, however, was shortest at this moisture content. No correlation could be traced between the moisture requirements of a given wheat variety and its reaction to *P. graminis* at different soil moistures.

The results with *P. triticina* were much less clear-cut, varying greatly with the different types of wheat, though here again there was no parallel between the incidence of infection at a given soil moisture and the ecological requirements of the variety. Chlorosis increased uniformly with a rising water content, but the number of pustules formed was greatest in some varieties at the highest, and in others at the lowest moisture. The incubation period of the rust was shortest at 75 per cent. and almost consistently longest at 50 per cent.

CALDWELL (R. M.), KRAYBILL (H. R.), SULLIVAN (J. T.), & COMPTON (L. E.). **Effect of leaf rust (Puccinia triticina) on yield, physical characters, and composition of winter Wheats.**—*Journ. Agric. Res.*, xlviii, 12, pp. 1049–1071, 1 fig., 3 graphs, 1934.

This is a full report of the results [given in tables and graphs] obtained by the authors in their study [a preliminary abstract from which has already been noticed: *R.A.M.*, xi, p. 440] of the effect of leaf [brown] rust (*Puccinia triticina*) on the yield, physical characters, and composition of winter wheats at La Fayette, Indiana, in 1931. This season was very favourable owing to the severity of the rust and absence of other serious diseases, all other conditions being in favour of high yields. In addition to the information already given, it is stated that the yield in grain and straw of very susceptible varieties (except Fulhard) was reduced by from 14·8 to 28·4 per cent., the reduction being approximately proportional to the severity of the rust.

Nearly 75 per cent. of the losses were caused by reduction in the number of grains in each ear, the remainder resulting from a reduction in weight per grain. An outstanding effect of the rust was the considerably increased proportion of yellow-berry or piebald grains in the hard and semi-hard varieties, and the production of grains more uniformly soft or starchy in the soft ones. The standard weight per bushel was slightly but consistently reduced. The starch content of the mature grain varied inversely with the protein percentage, which was very significantly reduced by severe infection. Sucrose was also reduced both in the mature grain, and in the culms and leaves of rusted plants at the nearly ripe stage. The percentages of phosphorus and total ash of the grain were not appreciably affected.

The macroscopical characters and composition of the grain of the highly resistant Fultz selection wheat showed no visible signs of being directly affected by sulphur dusting.

STROEDE (W.). **Untersuchungen über die geographische Verbreitung der physiologischen Formen des Weizenbraunrostes, Puccinia triticina Erikss. in Deutschland.** [Investigations on the geographical distribution of the physiologic forms of brown rust of Wheat, *Puccinia triticina* Erikss., in Germany.] —*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xxi, 1, pp. 115–120, 1934.

A tabulated account is given of the writer's analysis in 1932, for the occurrence of physiologic forms, of 45 collections of brown rust of wheat (*Puccinia triticina*) [*R.A.M.*, xiii, p. 689] from different parts of Germany. The following forms were found to be present: XI, XIII, XIV, XV, XVI, XX, XXI, and XXII, of which, as already observed by Scheibe, XI and XIV predominated [cf. ibid., ix, p. 768; xi, p. 231]. No evidence was forthcoming for a strict correlation between a given physiologic form and a definite region, though possibly some forms tend to be more freely distributed in one area than in another.

GASSNER (G.) & FRANKE (W.). **Über den Einfluss der Temperatur auf Stickstoffgehalt und Rostresistenz junger Getreidepflanzen.** [On the influence of temperature on the nitrogen content and rust resistance of young cereal plants.]—*Phytopath. Zeitschr.*, vii, 3, pp. 315–326, 1934.

Several wheat (Strubes and v. Rümkers Sommer Dickkopf, Malakoff, Carstens V, Michigan Amber, and Siegfried) and rye (Petkus winter and summer) varieties were tested for their content in albumin and soluble nitrogen compounds when grown in sand cultures with a nutrient solution at temperatures of 5°, 10°, and 20° C. under otherwise uniform experimental conditions [*R.A.M.*, xiii, p. 566].

The albumin content was found to rise sharply with a decline in temperature, while the soluble nitrogen compounds either remained stationary or showed a fluctuating and insignificant tendency to increase. If these facts are considered in the light of the established tendency of certain rusts (especially *Puccinia triticina* and *P. glumarum*) to cause heavier infection at low than at high

temperatures [ibid., xi, p. 231], the conclusion can be reached that the heavy increase of albumin accompanying a falling temperature predisposes the wheat plants to attack by these fungi.

GASSNER (G.) & STRAIB (W.). **Experimentelle Untersuchungen zur Epidemiologie des Gelbrostes (Puccinia glumarum [Schm.] Erikss. und Henn.).** [Experimental investigations on the epidemiology of the yellow rust (*Puccinia glumarum* [Schm.] Erikss. and Henn.).]—*Phytopath. Zeitschr.*, vii, 3, pp. 285–302, 1934.

In confirmation of previous results the writers found that most wheat varieties tend to show greater resistance to yellow rust (*Puccinia glumarum*) at high temperatures (average 22° to 23° C.) than at low ones (up to 15°) [*R.A.M.*, viii, p. 361; ix, p. 99; x p. 714]. The present tests were carried out on 31 German and American wheat varieties for which physiologic forms 2, 4, 7, and 9 of *P. glumarum* [ibid., xii, p. 273] served as inoculum.

Considerable differences were observed among the varieties and the forms of the rust as regards the 'critical temperature' at which the transition from susceptibility to resistance is effected. Thus, the winter variety Criewener 104 is highly susceptible to forms 2, 4, and 7 at 21°, at which temperature, however, it has already acquired resistance to 9; for Ackermanns Bayernkönig the critical temperature is much lower for form 7 than for the others used in the tests. Carstens Dickkopf V was the only wheat tested that showed complete susceptibility at 23°. Similar disparities in reaction to the various physiologic forms of yellow rust at different temperatures were observed among the summer wheats, of which Heines Kolben proved susceptible to form 9 even at a mean temperature of 24·3°. All the ten South American wheat varieties tested were highly susceptible to form 9 at 21°, whereas half of them acquired resistance to the remaining forms between 15° and 21°. Even at 24·3° four varieties, Oregon, Universal II, Alto da Sierra, and Rosafé, were still susceptible to form 9.

It is evident from these data that the importance of a given physiologic form of *P. glumarum* from the standpoint of wheat cultivation and breeding for immunity lies in its capacity to induce heavy infection and to reach the stage of sporulation under summer conditions in the field, which are normally adverse to the rust and favourable to the host. Varietal reaction to yellow rust should be tested in the first place in the greenhouse at both low and high temperatures, the former serving as a criterion of absolute resistance or immunity, while the latter indicate relative resistance and enable the prospects of 'summer resistance' to be gauged.

GASSNER (G.) & STRAIB (W.). **Untersuchungen über das Auftreten biologischer Rassen des Weizengelbrostes im Jahre 1932.** [Investigations on the occurrence of biologic strains of yellow rust of Wheat in the year 1932.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xxi, 1, pp. 59–72, 1934.

A tabulated account is given of the classification into physiologic forms of 77 collections of yellow rust of wheat [*Puccinia glumarum*], all but six of which (from Austria, Hungary, England,

Sweden, Finland, and Canada) originated in Germany in 1932 [see preceding and next abstracts].

Eleven physiologic forms were differentiated on the basis of their behaviour on ten standard varieties. These varieties were the same as those used in previous work [*R.A.M.*, xii, p. 272] with the addition of Rouge prolifique barbu. Chinese 166 was still used as a supplementary variety. Of the rust forms, numbers 2, 3, 4, 5, 7, 8, 9, and 12 are already familiar from previous studies, whereas 15, 16, and 17 are new. Form 15, isolated from Austrian and Finnish material, differs from the nearly related 12 only in its aggressive attack on Spalding's Prolific. Form 16, from Germany and Finland, closely allied to 9, is distinguished by its failure to infect Heines Kolben, while 17 (west Germany) may be separated from 7 by its virulence on Spalding's Prolific and Webster C.I. 3780; Carstens V is resistant to this form.

The prevalence of the different forms was observed to vary greatly according to the wheat varieties predominating in a given locality. The commonest in the main German wheat areas were 2, 3, and 5, while 7 and 8 were also frequently collected. Form 8 was also obtained from Swedish and Canadian material [cf. ibid., xiii, p. 689].

GASSNER (G.) & STRAIB (W.). **Weitere Untersuchungen über biologische Rassen und über die Spezialisierungsverhältnisse des Gelbrostes Puccinia glumarum (Schm.) Erikss. und Henn.** [Further investigations on biologic forms and on the specialization relations of the yellow rust *Puccinia glumarum* (Schm.) Erikss. and Henn.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xxi, 1, pp. 121–145, 1934.

A detailed, fully tabulated account is given of the writers' analysis, for the occurrence of physiologic forms, of 95 samples of yellow rust of wheat (*Puccinia glumarum*) obtained during 1933 from 59 localities in Germany, Austria, Hungary, Bulgaria, Turkey, France, Holland, England, Sweden, and Finland.

On the basis of their behaviour on eleven differential varieties of wheat (the same as those used in determining the forms in 1932) [see preceding abstract], 18 physiologic forms were separated, of which five (18 to 22, inclusive) are described as new, bringing the total for the species to 22. Forms 18 and 19 originated in Turkey, 20 in Bulgaria, 21 in Finland, and 22 in Germany. The first does not attack Strubes Dickkopf, Vilmorin 23, and Carstens V, thus differing from the related form 14. Vilmorin's red Scotch wheat is highly resistant to form 19, which in other respects resembles 10. Form 20 is similar to the foregoing except for its greater severity on Webster C.I. 3780. Form 21 differs from the two foregoing in its virulence towards the red Scotch wheat, and from the closely allied 10 in its failure to attack Strubes Dickkopf and Carstens V. The Prolific Red Bearded variety (Rouge prolifique barbu) is the only one differing appreciably in its reactions to 17 and 22, the latter in general causing a heavier type of infection, though with occasional deviations to a milder form which complicate separation. The geographical distribution of the physiologic

forms in different years is correlated, not only with the predominance of given wheat varieties in a certain area, but also with the fluctuations in varietal reaction induced by climatic factors.

The form of *P. glumarum* occurring on barley and couch grass (*Agropyrum repens*) in nature was found to correspond with form 4 from wheat. It was experimentally shown that all the physiologic forms of yellow rust so far differentiated, with the exceptions of 9 and 16, were capable of infecting six barley varieties, while all could attack *A. repens*. Most of the 38 rye varieties tested for their reaction to 14 of the forms of *P. glumarum* proved immune or highly resistant, but by means of selfing and crossing susceptible individuals it was possible so to increase the percentage of infection as to explain Eriksson's and Henning's statement (*Zeitschr. für Pflanzenkrankh.*, iv, [p. 197], 1894) as to the spontaneous occurrence of yellow rust on this host. Seven forms of *P. glumarum* were further found capable of infecting *Elymus junceus*. On the basis of these results it is considered impossible to maintain Eriksson's sub-division of the species into formae speciales. In future the yellow rust should be designated simply *P. glumarum*, irrespective of the host on which it is found, this species consisting of a great number of biological races or biotypes.

GARRETT (S. D.). **Factors affecting the pathogenicity of cereal root-rot fungi.**—*Biol. Reviews*, ix, 3, pp. 351–361, 2 graphs, 1934.

From an examination of all the available published work [which is briefly summarized and discussed] on the effect of soil temperature and moisture content on the incidence of foot rots on cereals, the writer concludes that the microbiological equilibrium of the soil plays an important part in the relative prevalence of the various agents of these disorders in different soil types. It seems probable, however, that the root-rotting fungi (including *Ophiobolus graminis*, *Gibberella saubinetii*, *Fusarium culmorum*, *Helminthosporium sativum*, and *Pythium arrhenomanes* var. *canadensis* [*R.A.M.*, xi, p. 434]) vary considerably in their susceptibility to biological antagonism [cf. ibid., xiii, p. 362]. Still more significant may be the variations in the physiological state of the mycelium under divergent soil conditions, the hyaline, thin-walled mycelium rich in protoplasm generally formed on an organic substratum probably being much more susceptible to adverse microbiological factors than the dark-coloured, resistant 'runners' whereby certain fungi spread through an inhospitable soil [ibid., xiii, p. 433].

It is possible that considerations of this order may ultimately throw light on the problem of the distribution of cereal foot-rotting pathogens in wheat-growing countries. In Australia, for instance, *H. sativum* is the chief root-rotting parasite of wheat in New South Wales, whereas in South Australia *O. graminis* is responsible for almost the entire damage [loc. cit.]. Extensive isolations have shown, however, that *H. sativum* is widely distributed in South Australian soils, where its failure to cause serious injury is thus in need of explanation.

Fron [G.]. **Sur la présence de Fusarium à la base des chaumes de Blé lors de l'épiaison.** [On the presence of *Fusarium* at the base of Wheat haulms at heading time.]—*Comptes rendus Acad. d'Agric. de France*, xx, 22, pp. 740–742, 1934.

Fusarium culmorum is stated to have been unusually prevalent on wheat, causing a basal stalk rot, in the plain of Chartres, in Seine-et-Oise, and in the Meaux region of France during the summer of 1934 [cf. *R.A.M.*, xiii, pp. 503, 569]. Conidia are produced in abundance on the stalks which, in affected plants, are reduced in numbers (sometimes to one), short, and with stunted, yellow, sterile ears.

Chiappelli (R.). **La golpe bianca del Frumento (Fusarium roseum).** [The white blight of Wheat (*Fusarium roseum*).]—*Giorn. di Risicolt.*, xxiv, 7, pp. 147–148, 1 fig., 1934.

Attention is drawn to the recent occurrence in Italy of white blight (*Fusarium roseum*) [*Gibberella saubinetii*: *R.A.M.*, xiii, p. 157] on the Damiano Chiesa, Mentana, and Ciro Menotti wheat varieties, the losses in the first-named amounting to as much as 30 per cent. of the crop. A brief note is given on the symptoms of the disease and its control.

Waldron (L. R.). **Increase of kernel weight in common Wheat due to black-point disease.**—*Journ. Agric. Res.*, xlviii, 11, pp. 1017–1024, 1934.

This is a tabulated account of the author's investigation of the effect of black point [*R.A.M.*, x, p. 20], associated in the samples tested with *Helminthosporium sativum* and a species of *Alternaria*, in about equal proportions, on the relative weight of wheat grains, during a heavy outbreak of the disease on various common wheats (*Triticum vulgare*) at Fargo, North Dakota, in 1933. In the five hybrids studied the weight of the black-point grains on any one plant was generally greater than that of the apparently non-infected grains (33·1 to 38·4 as against 27·1 to 32·2 gm. per 1,000 grains, respectively). Within any given grain group on the ear, e.g. the third floret group, the black-point grains were also significantly heavier than the clean ones. In one experiment, a coefficient of correlation of $0{\cdot}22 \pm 0{\cdot}04$ was established between the percentage of black point and total yield, and a coefficient of $0{\cdot}32 \pm 0{\cdot}04$ between black point percentage and weight of 1,000 grains. In a study of individual plants in another hybrid, a correlation coefficient of $-0{\cdot}09 \pm 0{\cdot}04$ was found between the percentage of black point and the yield of grain per plant, but the coefficient of correlation between black point and the weight per 1,000 grains was still $0{\cdot}32 \pm 0{\cdot}03$.

These results are considered to indicate that a portion of the weight differences is caused by a stimulation of the development of the endosperm, following the penetration of the fungus into the developing ovule, although they may also be attributed in part to a difference in infection of grains differing normally in size because of their position in the ear.

Gassner (G.) & Kirchhoff (H.). **Versuche zur Bekämpfung des Gerstenflugbrandes.** [Experiments in the control of loose smut of Barley.]—*Phytopath. Zeitschr.*, vii, 3, pp. 303–314, 1934.

The following methods are recommended, on the basis of recent experiments [which are tabulated], for the control of loose smut of barley [*Ustilago nuda*]: (1) three hours' immersion in water at 41° to 43° C. with the addition of 2 per cent. methylated spirit; and (2) one hour's moistening in a closed vessel containing 5 l. water at 50° to 52° per cwt. of seed-grain with an admixture of 3 per cent. methylated spirit [see above, p. 750].

Yu (T. F.), Chen (H. K.), & Hwang (L.). **Varietal resistance and susceptibility of foreign Barleys to covered smut (Ustilago hordei (Pers.) K. & S.)**—*Agric. Sinica*, i, 3, pp. 83–89, 1934. [Chinese summary.]

A fully tabulated account is given of experiments initiated by R. H. Porter in 1925 and continued by the writers up to 1933 on the varietal reaction of 367 foreign barleys to *Ustilago hordei* at Nanking, China [*R.A.M.*, v, p. 656; ix, p. 29]. The seeds were dehulled by hand [ibid., iii, p. 330] and thoroughly mixed with covered smut spores of local origin. A large number of the selections remained free from the disease during the eight-year period of the trials, but owing to their late maturing habit they are unsuitable for cultivation in the Nanking district. They should, however, prove useful in breeding work on account of their resistance to covered smut and other desirable qualities.

Ronsdorf (Liselotte). **Einige Versuche über biologische Rassen des Gerstenzwergrostes.** [Some experiments on biologic strains of the dwarf rust of Barley.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xxi, 1, pp. 109–114, 1934.

Six collections of dwarf [brown] rust of barley (*Puccinia anomala*) from different parts of Germany were analysed for the occurrence of physiologic forms on the basis of their behaviour on the ten standard varieties used by Hey [*R.A.M.*, xi, p. 36], with the addition of a four-rowed Egyptian summer barley which proved useful in separating the new form IX from forms II and IV.

The presence of physiologic forms III, IV, and IX was established, the last-mentioned (from the Danzig district) being new and distinguished mainly by its capacity for severe infection on the Australian Recka variety. The results of Hey's tests with forms II to V, inclusive, were substantiated in the main by the writer's experiments, except that Hey's forms II and V were difficult to separate in the author's tests, and that all produced usually a somewhat more virulent type of infection. The influence of varying temperatures on the incidence of attack by the different physiologic forms on certain barley varieties was confirmed [loc. cit.].

Christensen (J. J.). **Nonparasitic leaf spots of Barley.**—*Phytopath.*, xxiv, 7, pp. 726–742, 6 figs., 1934.

No evidence of parasitic origin could be detected in certain types of leaf spotting of barley occurring in certain seasons in Minnesota and in some cases simulating those due to *Helminthosporium sativum* and *H. gramineum*. Some of these appear to be heritable, while others may be the result of malnutrition or of the presence of boron in the soil; the latter substance, supplied either in the form of boric acid (10 to 20 gm. per sq. m.) or sodium borate (0·1 or 0·2 gm. per pot), caused lesions resembling the spot blotch due to *H. sativum* on a number of standard varieties including Glabron, Manchuria, Minsturdi, Black Hull-less, Lion C.I. 923, New South Wales Selection, and Purple Nudum C.I. 2250. Field and greenhouse tests and observations extending over a number of years indicate that varietal behaviour in respect of the non-parasitic leaf spots is relatively stable. Barley leaves injured by boron were not rendered more susceptible to *H. sativum* or more resistant to *Erysiphe graminis* than untreated plants, though the latter may be less apparent owing to the diminished area of healthy leaf tissue suitable for the growth of the parasite. The non-parasitic leaf spots appeared at different stages in the vegetative growth of the 125 varieties studied and were not prevented by spraying or dusting with sulphur, iron, or manganese compounds.

Stanton (T. R.), Reed (G. M.), & Coffman (F. A.). **Inheritance of resistance to loose smut and covered smut in some Oat hybrids.**—*Journ. Agric. Res.*, xlviii, 12, pp. 1073–1083, 2 graphs, 1934.

This is a brief, tabulated account of the authors' study [cf. *R.A.M.*, xiii, p. 570] of the inheritance of resistance to two biological forms (Missouri and Fulghum) of oat loose smut (*Ustilago avenae*) and the Missouri strain of covered smut (*U. levis*) [*U. kolleri*] in the F_2 and F_3 generations of six oat crosses, namely, Richland × Markton, Richland × Fulghum, Markton × Iogold, Markton × Black Mesdag, Cornelian × Markton, and Monarch Selection × Black Mesdag. Black Mesdag and Markton are highly resistant to both smuts, Iogold and Cornelian rather highly susceptible, and Richland and Fulghum rather resistant, except Fulghum to its own strain of *U. avenae*, from which most of the other varieties are immune, Monarch Selection being very susceptible to *U. avenae* (Missouri) but very resistant to *U. kolleri*. In most of the hybrids tested, completely resistant progenies predominated over segregating progenies, with very few susceptible descendants. The results obtained from inoculating F_3 plants of two Monarch Selection × Black Mesdag hybrids with the Missouri form of *U. avenae* indicated a simple dominance for resistance to this smut, segregation occurring on the basis of a 3 to 1 ratio. The fact that when F_2 plants of the cross between the two entirely resistant Markton and Black Mesdag varieties were inoculated with the Fulghum form of *U. avenae*, 25 per cent. of the F_3 progenies were smutted may indicate that both varieties may carry complementary factors for susceptibility, which, when brought together through hybridization, may result in susceptibility.

Săvulescu (T.) & Rayss (T.). **Quelques réactions du champignon 'Nigrospora oryzae' (B. et Br.) Petch, parasite sur le Maïs.** [Some reactions of the fungus *Nigrospora oryzae* (B. & Br.) Petch parasitizing Maize.]—*ex* Livre publié en Hommage et dédié à la Mémoire du Professeur Cantacuzène, pp. 661–677, 7 figs., Masson et Cie. [Paris], 1934.

In continuation of their studies on *Nigrospora oryzae* on maize in Rumania [*R.A.M.*, xiii, p. 571], the authors give a detailed account of microchemical tests which failed to reveal the presence of cellulose or pectose and pectic compounds in the mycelial membranes of the fungus: the membranes were shown to contain callose and chitin, and to be permeated on the outside with fatty acids which render them impervious to the action of acids and to the penetration of stains. Further experiments showed that the mycelium of *N. oryzae* exerts a diastatic action on cellulose, which is broken down to a hydrocellulose with a less complex molecule. This action is a direct function of the moisture content of the substratum, a fact which explains the preference of the fungus for the *dentiformis* variety of maize, the rachis of which is richer in water than that of the common Rumanian variety (*vulgata*).

Tanaka (I.). **Eine neue Art des falschen Mehltaupilzes auf dem Buchweizen.** [A new species of the downy mildew fungus on Buckwheat.]—*Trans. Sapporo Nat. Hist. Soc.*, xiii, 3, pp. 203–206, 3 figs., 1934.

Peronospora fagopyri I. Tanaka sp. nov., the agent of a destructive leaf blight of buckwheat (*Fagopyrum esculentum*) in Japan, is characterized by an effuse, greyish-purple mycelium; conidiophores mostly arising in groups of three from the stomata, 240 to 440 by 8 μ, 4 to 6 times dichotomously branched near the apex: dingy purple, ellipsoid conidia, 20 to 30 by 14 to 18 μ; spherical oogonia, 52 to 55 μ in diameter; and yellowish-brown to dark brown oospores, 25 to 30 μ in diameter. A table is given showing the differences between the species under observation and four species already known on Polygonaceae, namely, *P. rumicis* on *Rumex* spp., *P. polygoni* and *P. americana* on *Polygonum* spp., and *P. jaapiana* on rhubarb [*R.A.M.*, v, p. 279].

[No mention is made of *P. ducometi* Siem. & Jankow. (syn. *P. fagopyri* Jaczewski): ibid., xii, p. 550.]

Williams (R. O.). **Wither-tip disease and Limes.**—*Proc. Agric. Soc. Trinidad and Tobago*, xxxv, 7, pp. 275–282, 1934.

Wither-tip of limes (*Gloeosporium limetticolum*) [*R.A.M.*, xii, pp. 22, 143, 689] which in the American tropics occurs from the Florida Keys to British Guiana and is present on most of the West Indian islands, first appeared in Trinidad in 1917, reducing the export of juice from 29,000 galls. in that year to nil in 1922. It was first reported from Dominica [ibid., xiii, p. 684] in the latter year, since when, in conjunction with other factors, it has reduced the export of limes from 516,000 to under 50,000 barrels a year. In 1933, it was discovered in Grenada, where it has already rapidly increased in prevalence and intensity. The considerable reduction

in yield due to infection varies with the amount and distribution of the rainfall. In Dominica, limes growing in regions of an elevation of 1,000 ft. and an annual precipitation of 180 in. have been entirely killed out as a result of continuous infection of the young flushes. On one property with 100 in. rainfall the yield has fallen from 150 to 100 barrels per acre, and the best yield obtainable in the island is now only 150 barrels per acre, as compared with 200 formerly.

Spraying once or twice with lime-sulphur (1 in 30 or 1 in 40) when the trees are flushing and flowering would give beneficial results in dry localities in Trinidad where there is a definite main flowering period, but is uneconomic in wet ones.

In 1925, cross-breeding trials were begun in Trinidad between the West Indian lime and a resistant seedling (No. 2182) obtained from the Philippine Islands; with the former as the female parent, two resistant hybrids, T_1 and T_6, were obtained which were selected for field trials. The former proved to have the more desirable characters [which are described], and T_1 limes are now being dispatched regularly to New York and Canada, where they realize the same price as the ordinary West Indian limes.

Winston (J. R.). **Preparation and packing of Oranges for shipment.**—*Indus. & Engin. Chem.*, xxvi, 7, pp. 762–765, 1 diag., 3 graphs, 1934.

Attention is drawn to the necessity of applying the 8 per cent. borax wash, which has given such good control of the stem-end rots of citrus caused by *Diplodia* [*natalensis*] and *Phomopsis* [*Diaporthe citri*: *R.A.M.*, xiii, p. 26] as soon as possible after harvesting and before colouring. A momentary dip in the solution at 110° F. has been found to be equally effective with a longer bath; the borax should be allowed to remain on the fruit from two to three days. The most practical method of giving the borax treatment is to float the fruit through long tanks containing the heated solution. The fruit should be pre-cooled immediately after packing; in Florida this process is generally conducted in rooms at a temperature of 32° or below provided with an air blast of 5,000 cu. ft. per minute, the direction of which is changed hourly, reducing the temperature of the fruit to well below 40° within 24 hours. Thereafter a temperature of 40° to 45° should be maintained in the storage rooms.

Van der Plank (J. E.). **Observations on the infection of Navel Oranges by green mould (Penicillium digitatum, Sacc.).**—*S. Africa Dept. of Agric. Sci. Bull.* 127, 20 pp., 1 pl., 3 graphs, 1934.

In a study made in South Africa of the sources of infection by *Penicillium digitatum* [*R.A.M.*, xii, p. 168] in ordinary boxes of oranges young lesions below a certain given size were classified according to the way in which infection had started, five classes being recognized, viz., puncture, injury, stem-end, navel-end, and undetermined. The first class comprised infections developing at well-defined punctures (possibly of insect origin) penetrating into but not beyond the albedo. Infections of the injury class arose

from any visible wound other than a puncture; these wounds affected the albedo and sometimes extended into the juice tissues. The stem-end class consisted of pure green mould infections beginning as a small, soft, water-soaked area to the side of the button, and not associated with visible injuries or fungi other than *P. digitatum*. Infections placed in the navel-end class started at that end, but the exact point of origin was rather variable. The undetermined class included all infections that could not be grouped in the other classes. In the consignments examined in 1931 after removal from cold storage the proportion of the total wastage due to each class was puncture, 13·8, injury, 4·2, stem-end, 61·2, navel-end, 9, and undetermined, 11·8 per cent., the corresponding figures for 1932 being 17·9, 13·1, 52·4, 9·5, and 7·1 per cent.

The evidence obtained indicated that the stem- and navel-end types of decay were due to infection without previous injury, though such infection was rare except at these two points.

There were no appreciable amounts of contact wastage or wastage arising merely from the presence of infected fruits in the boxes. The proportion of wounds to become infected by *P. digitatum*, as estimated by counting infections visible up to three weeks after discharge from cold storage, was under 25 per cent.

Reed (H. S.) & Frémont (Mlle T.). **Sur les réactions des cellules de racines de Citrus à l'infection par les mycorrhizes.** [On the reactions of Citrus root-cells to mycorrhizal infection.]—*Comptes rendus Acad. des Sciences*, cxciv, 1, pp. 84–87, 2 figs., 1934.

This is a slightly expanded account of the writers' observations in California on the cytological reactions of citrus roots to mycorrhizal infection (stated to occur also in specimens received from Sicily, Formosa, and Malaya), a note on which has already appeared [*R.A.M.*, xiii, p. 589].

Ocfemia (G. O.). **Bud rot of Coconut.**—*Philipp. Agric.*, xxiii, 1, pp. 4–10, 2 figs., 1934.

A semi-popular account is given of the bud rot of coco-nut palms caused by *Phytophthora palmivora* [see below, p. 813] in the Philippines and elsewhere, with directions for its control by appropriate cultural measures.

Report of committee on Coffee berry disease.—*Kenya Dept. of Agric. Bull.* 3 *of 1934*, 20 pp., 1934.

In Kenya, coffee berry disease [apparently due to a strain of *Glomerella cingulata*: *R.A.M.*, xii, p. 8], first reported in 1922, causes considerable annual loss to growers, in some cases amounting to 75 per cent. of the crop. At present it appears to be confined to the west of the Great Rift Valley, and is serious only at altitudes of about 5,500 ft. or over. A small experiment station devoted to the study of the disease has been established in Sotik. Field observations and experiments [which are described, and the results of which are tabulated and discussed] conducted in 1933 to investigate the factors affecting the incidence of the disease indicated that the destructive effect of infection is due to the expansion of

the plantation system into an area where the conditions are more suitable to the fungus than to the Mocha type of coffee grown. The variation in the susceptibility of different bushes, shown even when young and under apparently identical conditions, was very noticeable. A small area of Blue Mountain coffee has hitherto shown marked resistance. The paper concludes with a copy of a questionnaire regarding the disease sent to growers and an analysis of the replies received.

Massey (R. E.). **Studies on blackarm disease of Cotton. III.**— *Empire Cotton Growing Review.* xi, 3, pp. 188–193. 2 figs., 1934.

Further field and laboratory investigations conducted in the Sudan into cotton blackarm [*Bacterium malvacearum*: *R.A.M.*, x, p. 661; xiii, p. 696] showed that at soil temperatures between 25° and 30° C., increase in soil moisture up to 40 parts of water in 100 of dry soil resulted in increased germination and increased blackarm infection: at 50 parts of water to 100 of dry soil both were reduced. Maximum infection resulted when the soil temperature fell at some time between 24 and 48 hours after sowing. When Gezira soil was added to cultures of *Bact. malvacearum* the pathogenic smooth form was largely transformed into the non- or feebly pathogenic rough form. For infection to take place the organism had to enter the tissues of the germinating seed within 72 hours of sowing [ibid., x, p. 662], but once entry is effected, changes in soil moisture or temperature taking place after this critical period do not greatly affect the progress of the disease.

Seed disinfection by means of home-made machines consisting of 40-gallon oil drums slung diagonally on a horizontal axle supported on trestles and turned by hand was found to be very effective, 20 such drums dusting 600 sacks, each containing 270 lb. of seed, in 5 hours: the addition of a little water to the seed facilitated the operation.

Lesions developed in the open at a relative humidity of only 25 per cent. (maxima shade temperatures about 33°, minima 16°), when the leaves were sprayed with sufficient force to overcome surface tension and the leaf surface was thoroughly wetted; the incubation period was, however, prolonged to 10 or 12 days in such dry air. With relative humidities of 60 to 75 per cent. and temperatures ranging from 40° to 30° the incubation period was frequently reduced to 3 days. Many more lesions were obtained with a warm spray (32°) than with one cooled to 10°. The highest percentage of active lesions developed on healthy, rapidly growing plants with large leaf surfaces. Senescent tissues and leaves thickened by leaf curl were much more resistant than rapidly developing tissues; stem infections occurred only in very young tissues, and were derived primarily from a leaf via the petiole or from an axillary bud. The organism remained dormant for a long period on leaf surfaces which had dried before it had effected an entry.

Bact. malvacearum was not isolated from seed-bed soil except when infected plant remains were present. Dry, woody tissues retained the organism in a viable condition for a long period, alternate wetting and drying, unless frequently repeated, failing to sterilize such material. More fragile tissues, such as leaves and

bracts, when reduced to powder lost their infectiousness in four months, but may be an important means of spread during prolonged rains. Fallen bolls containing infected seed are a very dangerous source of carry-over, as the germination of the enclosed seed may be delayed until the new crop is established.

TAUBENHAUS (J. J.) & CHRISTENSON (L. D.). **Insects as possible distributing agents of Cotton wilt caused by Fusarium vasinfectum.**—Abs. in *Phytopath.*, xxiv, 7, pp. 839–840. 1934.

Fusarium vasinfectum, the agent of cotton wilt [*R.A.M.*, xiii. p. 698], was recovered in a viable and infective condition from the surface-sterilized bodies or faecal pellets of a number of insects [a list of which is given] fed on plant material known to be infected by the fungus. It is suggested that insects may play a part in the dissemination of the disease.

MÉTALNIKOV (S. S.). **Action des rayons solaires sur les spores de bactéries pathogènes pour les insectes.** [The action of solar rays on the spores of bacteria pathogenic to insects.]—*Ann. Inst. Pasteur*, liii, 1, pp. 93–99, 1934.

The information given in this paper on the effects of solar rays on *Bacterium* Cazaubon and *Bact. ephestiae* No. 1, pathogenic to the pink boll worm of cotton (*Gelechia gossypiella*) in Egypt, has already been summarized from another source [*R.A.M.*, xiii, p. 29]. *Bact. pyreneii* (black), isolated in France from *Pyrausta nubilalis* caterpillars on maize, is mentioned as being included in the trials with similar results to the foregoing.

MARCHIONATTO (J. B.) & VALLEGA (J.). **Ensayos a campo del 'hongo verde' ('Sporotrichum paranense' March.) de la langosta voladora.** [Field experiments with the green fungus' (*Sporotrichum paranense* March.) of the winged locust.]—*Bol. Mens. Min. Agric. Nac.*, Buenos Aires, xxxv, 1–3, pp. 69–77, 6 figs., 2 graphs, 1933. [Received October, 1934.]

Particulars are given of field experiments in Santo Tomé and Paraná, Argentina, with the so-called 'green fungus' (*Sporotrichum paranense*) of the winged locust [*Schistocerca paranensis*: *R.A.M.*, xiii, p. 439], from which it appears that even under conditions relatively unfavourable to the fungal parasite a mortality of up to 65 per cent. of the insects may be attained by spraying the latter with spore suspensions. The effects of the fungus do not begin to be felt by the locusts for at least five days after inoculation, so that speedy destruction cannot be accomplished by this method. However, in view of its facility of cultivation and application the 'green fungus' should be further tested in districts where the locusts spend a considerable part of the winter.

DIDDENS (HARMANNA A.). **Schimmels bekend onder den naam Monilia.** [Fungi known under the name *Monilia*.]—Reprinted from *Antonie van Leeuwenhoek. Nederl. Tijdschr. voor Hyg., Microbiol. en Serol.*, i, 3, 11 pp., 7 figs., 1934.

Attention is drawn to the existing confusion in the nomenclature

of the yeast-like fungi grouped under the name of *Monilia* in text books of medical mycology [*R.A.M.*, xiii, p. 635]. Vuillemin's classification, largely followed by medical workers, is considered to have given far too wide a definition to the genus *Monilia*, and even Berkhout's genus *Candida* [ibid., iii, p. 556] covers several more or less related genera. The hope is expressed that Langeron's and Talice's system of classification, in which *Candida* is split into the six genera [ibid., xi, p. 476] *Mycotorula*, *Mycotoruloides*, *Candida*, *Mycocandida*, *Blastodendrion*, and *Geotrichoides*, may be adopted pending further studies.

Giovannola (A.). **Sulla permanenza dei caratteri biochimici di alcune specie di Monilia mantenute in coltura per vari anni.** [On the permanence of the biochemical characters of certain species of *Monilia* maintained in culture for a varying number of years.]—*Ann. d'Igiène*, xliv, 7, pp. 641–645, 1934.

The writer examined the biochemical characters of five human pathogens of the *Monilia* group after varying periods in culture, namely, *Candida tropicalis*, *Monilia* (*Geotrichoides*) [*C.*] *krusei* (25 years each), *M.* (*Blastodendrion*) [*C.*] *pinoyi*, *M.* [*C.*] *pseudotropicalis* (24 years each), and *M. macedoniensis* var. *macedoniensoides* (17 years) [cf. *R.A.M.*, xiii, p. 635 and preceding abstract] and found them unaltered as judged by their behaviour on glucose, levulose, galactose, lactose, maltose, saccharose, and inulin at 37° C. [ibid., x, p. 663; xiii, p. 441].

Connor (J. I.) & McKie (Margot). **Pathogenicity of yeast-like fungi.**—*Med. Journ. of Australia*, xxi (ii), 2, pp. 52–53, 1934.

In addition to the strains of *Monilia* [*Candida*] *albicans* isolated from cases of paronychia at Melbourne [*R.A.M.*, xiii, p. 163], the writers have obtained four strains of *M. parapsilosis* [ibid., xiii, p. 370] from general monilasis, web of toes, erosio interdigitalis, and blood culture, respectively. The organisms were differentiated by ordinary cross-agglutinin and agglutinin absorption tests, the results of which, together with the sugar reactions [see preceding abstract] of the groups of organisms hitherto found, are tabulated.

Ciferri (R.) & Redaelli (P.). **Histoplasma capsulatum Darling, the agent of 'histoplasmosis': systematic position and characteristics.**—*Journ. Trop. Med. & Hygiene*, xxxvii, 18, pp. 278–280, 1934.

The writers summarize the results of their studies on the agent of Darling's disease or histoplasmosis [*Posadasia capsulata*: *R.A.M.*, xiii, p. 637], cultivated for the first time in 1933 by De Monbreun from a case in Tennessee, United States.

Cultural dimorphism and reversibility are present, the colonies on common solid media at laboratory temperature being of a white, cottony type (hyphomycetic or III), while those on blood agar at 37° C. are small, greyish, globose, and yeast-like (type I): an intermediary type (II) is also observed. The cultures of type III consist of a white mycelium producing numerous rounded to piriform, smooth hypnospores, evolving into 'stalagmospores' with a thick, irregular, papillate, verrucose, or echinulate epispore, capable of

producing a germ-tube. On blood agar or a similar substratum at 37° the hypnospore forms a profusion of budding cells multiplying by the same process. On the inoculation of a type III culture into a guinea-pig, rabbit, or rat, the mycelium and stalagmospores are gradually absorbed, but the hypnospore produces blastospores (type I) within 24 hours; these represent the parasitic stage of the fungus.

As regards the taxonomy of *Histoplasma capsulatum*, the authors consider that it must be classified as a member of the Blastosporales *sensu lato* and they place it in a new family Histoplasmaceae Cif. et Red. A Latin diagnosis is given of the new family and an English one of the genus *Histoplasma* Darling (1906) emend. Cif. et Red.

Redaelli (P.) & Ciferri (R.). **Études sur l' 'Histoplasma capsulatum' Darling: I. Reproduction expérimentale de l'histoplasmose, et définition de la maladie comme réticulo-histocytose parasitaire atteignant divers systèmes de l'organisme.** [Studies on *Histoplasma capsulatum* Darling: I. Experimental reproduction of histoplasmosis and definition of the disease as a parasitic reticulo-histocytosis attacking different systems of the organism.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, vi, 6, pp. 193–195, 1934.

An account is given of experiments in which the authors succeeded in reproducing characteristic symptoms of histoplasmosis by means of inoculations of guinea-pigs and rabbits with pure cultures of the cottony growth of *Histoplasma capsulatum* [*Posadasia capsulata*: see preceding abstract], just as De Monbreun has already been able to do on monkeys with the yeast form. The organism is stated to have been considered by Darling (in 1907) a protozoon, but its fungal nature was recognized by Rocha Lima in 1912.

De Cisneros (J. M. G. J.). **Die Hyphenverschmelzung bei den Dermatophyten und ihre praktische Bedeutung für die Differenzierung.** [Hyphal fusion in the dermatophytes and its practical significance for differentiation.]—*Zentralbl. für Bakt.*, Ab. 1 (*Orig.*), cxxxii, 1–2, pp. 91–101, 1 pl., 3 figs., 1934.

Hyphal fusions were observed in only 8 out of 30 species of dermatophytes grown in pure culture in Grütz's maltose bouillon or dextrose bouillon, viz., *Parendomyces asteroides*, *Cephalothecium* [*Trichothecium*] *roseum*, *Achorion gypseum*, *Trichophyton gypseum asteroides* [*T. mentagrophytes*], *Microsporon ferrugineum*, *M. audouini*, *T. acuminatum* [cf. *R.A.M.*, xi, p. 458], and *Epidermophyton clypeiforme* [*E. floccosum*: ibid., x, p. 243]. When these were grown in culture with one another no fusions occurred between the hyphae of different species. Only in *P. asteroides*, *A. gypseum*, and *T. mentagrophytes* was fusion observed between different strains of the same species. The process can thus, in the writer's opinion, possess only a restricted and supplementary value as an aid to classification.

[An expanded account of these studies appears in *Atti Ist. Bot. Univ. Pavia*, Ser. IV, v, pp. 45–75, 25 figs., 1934.]

Ebihara (M.). **Über einen auf einer der Inseln Izushichitoo aufgefundenen Trichophytonstamm; insbesondere über den Einfluss des Nährbodens auf die Entwicklung der Spindelsporen.** [On a *Trichophyton* strain detected on one of the Izushichitoo islands, especially on the influence of the medium on spindle spore development.]—*Japanese Journ. of Dermatol.*, xxxvi, 2, pp. 211–218, 8 figs., 1934. [Japanese, with German summary on pp. 40–41.]

From a superficial scalp affection of a ten-year-old boy on a Japanese island the writer isolated a variant of *Trichophyton coccineum* [*R.A.M.*, xii, p. 443], which was especially remarkable for its formation of spindle spores on Pollacci's medium with the addition of liquor or serum, the former being particularly favourable. Spindle spores are a characteristic of *T. purpureum* [*Sabouraudites ruber* or *T. rubrum*: ibid., xiii, p. 303] which differs from *T. coccineum*, however, in other respects; the former, moreover, mostly occurs on the smooth skin of adults, and the latter on children's hair. The organism under observation would appear to represent a transitional stage between the two species.

Olah (D.). **Acrostalagmus cinnabarinus Corda isolato da un caso di tricofizia profonda.** [*Acrostalagmus cinnabarinus* Corda isolated from a case of deep trichophytosis.]—*Atti Ist. Bot. Univ. Pavia*, Ser. IV, v, pp. 121–124, 1934. [Latin and English summaries.]

From a tumour on the face of a male patient the author isolated a strain of *Acrostalagmus cinnabarinus* [*R.A.M.*, xi, p. 577], inoculations with which into laboratory animals gave negative results; he considers, however, that the fungus is pathogenic.

Leão (A. E. de A.). **Sur une mycose osseuse par Acremoniella. Nouvelle espèce de champignon trouvée chez l'homme: Acremoniella rugulosa n. sp.** [On a bone mycosis caused by *Acremoniella*. A new species of fungus found on man: *Acremoniella rugulosa* n. sp.]—*Comptes rendus Soc. de Biol.*, cxvi, 26, pp. 1158–1160, 1934.

Acremoniella rugulosa n. sp. was isolated from the fibula of a 16-year-old Brazilian boy. The fungus grew well on Sabouraud's and other standard media, forming white (later darkening) raised colonies, rapidly coagulating milk, and slowly liquefying gelatine. It is characterized by hyaline or yellowish, septate, rugulose hyphae, 4 μ in diameter; straight, hyaline or dark, rugulose conidiophores, 20 by 2 to 4 μ; and spherical or elliptical, yellowish (ultimately black), rugulose conidia, 6 to 12 μ in diameter, borne singly at the apex of the conidiophore. The new species differs from *A. perinii* and *A. verrucosa*, both reported from Italy, in the structure of the conidiophores and in conidial dimensions.

Leão (A. E. de A.), da Silva (J. O.), & Proença (M.). **Sur un cas de sporotrichose à Sporotrichum beurmanni, observé pour la première fois chez un mulet à Rio de Janeiro.** [On

a case of sporotrichosis due to *Sporotrichum beurmanni*, observed for the first time in a mule at Rio de Janeiro.]—*Comptes rendus Soc. de Biol.*, cxvi, 26, pp. 1157–1158, 1934.

Sporotrichum beurmanni [*R.A.M.*, xii, p. 23] was found to be responsible for lesions on a mule at Rio de Janeiro, the present being the first record of the fungus on this animal in South America. The fungus grew well at 25° to 30° C. on Sabouraud's glucose and maltose agars, and on potato and carrot with glycerine, forming chocolate-coloured (black on potato), radiating colonies. Rats were readily infected by pure cultures of the organism.

Gitman (L.) & Boytchenko (E.) Справочник по болезням новых лубяных культур. [A manual of the diseases of the new bast-fibre plants.]—124 pp., 86 figs., New Bast Fibres Res. Inst., Moscow, 1934.

The feature of main interest in this small book is a list, arranged by the hosts, of all the fungi which have been recorded both in Russia and abroad on the various organs of the fibre-yielding plants recently introduced into Russia, namely *Abutilon* spp., *Apocynum venetum* and *A.* spp., *Asclepias* spp., *Boehmeria* spp., *Cannabis sativa*, and *Hibiscus cannabinus* [*R.A.M.*, xiii, p. 372], as well as those found on *Dipsacus fullonum* and other species of this genus. The list gives some microscopical details of the fungi, with a bibliography of papers in which they are more fully described and, in the case of those organisms which have been recorded in Russia, a brief description of the macroscopical symptoms caused by them. The list is preceded by some general considerations on the diseases of the hosts so far observed in Russia.

Sartory (A.), Sartory (R.), Meyer (J.), & Bäumli (H.). **Reproduction expérimentale de maladies cryptogamiques du papier.** [The experimental reproduction of fungous diseases of paper.] —*Comptes rendus Acad. des Sciences*, cxcix, 3, pp. 222–224, 1934.

Two groups of fungi attacking cellulose were differentiated by the writers on the basis of inoculation experiments on clean paper tyndallized in Roux and Borrel tubes at 100° C. and subsequently held at 27°, namely, (1) *Aspergillus* sp., *Fusarium* sp., and *Cladosporium herbarum* var. *cellulosae*, which produce endoferments; and (2) *Actinomyces* sp. and *Monilia* sp., forming exoferments. The fungi of the first group produce a conspicuous discoloration varying with their different pigments, whereas those of the second cause a gradual disintegration of the fibres and perforation of the paper, a process requiring a period of up to two years to accomplish. The following were the times (*a*) of commencement, and (*b*) of cessation of cellulolysis observed: *Aspergillus* (*a*) 8th to 12th day, (*b*) 40th to 45th; *Fusarium* (*a*) 30th to 36th, (*b*) 48th to 50th; *Cladosporium* (*a*) 5th to 8th, (*b*) 40th to 45th; *Actinomyces* and *Monilia* (*a*) 3rd to 4th, (*b*) still proceeding after 50th.

ARONESCU (ALICE). **Diplocarpon rosae; from spore germination to haustorium formation.**—*Bull. Torrey Bot. Club*, lxi, 6, pp. 291–329, 5 pl., 1 fig., 1934.

This is a detailed and fully illustrated account of the author's investigation under controlled conditions of the early stages of infection of young rose leaves by *Diplocarpon rosae* [*R.A.M.*, xii, p. 696]. Under optimum environmental conditions (a saturated atmosphere and a mean temperature of about 75° to 80° F.) the spores complete germination on the leaf surface and form appressoria (not invariably produced) in about nine hours. An infection peg then penetrates the cuticle mechanically and enlarges into a sub-cuticular infection hypha. This passes down between the epidermal cells. Fine club-shaped haustoria are formed in the epidermal cells. In about 48 hours from inoculation hyphal strands develop subcuticularly. Browning of the host cells may start during the very early stages of invasion, and is chiefly responsible for the dark colour of the leaf spots which, under the conditions of the tests, usually appeared on the third day from inoculation. Further hyphal growth develops from the parallel strands about the sixth day, the main purpose of which is to find new places for penetration and formation of haustoria in cells not previously penetrated. These hyphae sometimes reach as far as the lower layers of the outer wall of the epidermis, but they do not penetrate into the lumen except by haustoria. Intracellular hyphae only appear at a late stage after the cells have been killed.

The work indicated that petioles and young rose stems may also be infected, and that the infection of all organs is very little influenced by the absence of light. The impervious cross wall laid down by the infection hypha by the thirteenth hour from inoculation may be the means by which the fungus is protected against drying out, so as to ensure its invasion regardless of weather conditions. In the author's view, *D. rosae* seems to represent a transitional and still rather weak stage of adaptation to parasitic life.

PETHYBRIDGE (G. H.). **Snapdragon (Antirrhinum) rust.**—*Journ. Min. Agric.*, xli, 4, pp. 336–340, 1934.

By June, 1934, snapdragon [*Antirrhinum majus*] rust [*Puccinia antirrhini*: *R.A.M.*, xiii, p. 704], first reported in England in 1933, though evidence is cited to show that it was almost certainly present several years before, had appeared in 15 southern and south-eastern counties, some of the attacks being almost devastating in their severity. Seedlings of ten different varieties of *Antirrhinum* grown (under conditions precluding outside infection) at Harpenden from rusted plants remained unaffected.

TIDDENS (BERBER A.). **Ueber die Wurzelfäule der Primula obconica, verursacht durch Thielaviopsis basicola Ferraris.** [On the root rot of *Primula obconica* caused by *Thielaviopsis basicola*.]—*Phytopath. Zeitschr.*, vii, 3, pp. 223–229, 3 figs., 1 graph, 1934.

This is a condensed account of the writer's studies on the root rot of *Primula obconica* caused by *Thielaviopsis basicola* in Holland,

a notice of which from another source has already appeared [*R.A.M.*, xii, p. 513].

Brown (Nellie A.). **A gall similar to crown gall, produced on Gypsophila by a new bacterium.**—*Journ. Agric. Res.*, xlviii, 12, pp. 1099–1112, 4 pl., 1934.

This is a full morphological and cultural account of the causal organism of the soft, nodular gall on *Gypsophila paniculata*, a brief description of which has already been noticed [*R.A.M.*, xii, p. 224]. The organism is considered to be new to science and is named *Bacterium gypsophilae*, with a technical description. It is a motile, capsulate, non-sporiferous, Gram-negative, non-acid-fast, facultative aerobic rod, 0·4 to 1·2 by 0·2 to 0·8 μ in diameter, with several bipolar flagella, forming circular, smooth or rough, yellow, butyrous colonies on beef-infusion agar; it slowly liquefies gelatine but not blood serum, coagulates milk, and reduces litmus in 9 to 12 days; it produces ammonia and a trace of hydrogen sulphide, but no indol, and has no diastatic action; acid without gas is produced with saccharose, dextrose, maltose, mannite, but not lactose. Its temperature range for growth is from 5° to 40° C. with an optimum at over 30°; the thermal death point is between 52° and 53°. It grows at P_H values ranging from 5·1 to 9, with an optimum between 6·5 and 6·7. In beef bouillon and sterile milk the bacterium survived for eight months at 22° to 28° and for over 11 months at 14°, but on cover glasses it only withstood four days' drying. In a table these characters are compared with those of *Bact. beticola* [loc. cit.].

Galls were produced by inoculation on the related plants *Lychnis chalcedonica*, *Dianthus plumarius*, *Silene armeria*, and *Saponaria paniculata*. Well-defined swellings but no galls developed on inoculated potato stems, while no result followed the inoculation of several common hosts of *Bact. tumefaciens*.

The paper terminates with a brief survey of the conditions which appear to govern the occurrence of the disease in nature, and with a few suggestions for its control.

McWhorter (F. P.) & Reynolds (H. J.). **New Narcissus Botrytis disease in the Pacific Northwest.**—*Plant Disease Reporter*, xviii, 5, pp. 51–52, 1934. [Mimeographed.]

In a restricted area of King County, Washington, Laurens Koster and Glory of Sassenheim *Narcissus* plantings covering over 200 acres were destructively attacked in April, 1934, by a species of *Botrytis* apparently identical with that described by Dowson as *B. polyblastis* [*R.A.M.*, viii, p. 41]. Inoculations with pure cultures of the fungus from the large, chocolate-coloured, yellow-bordered lesions on the foliage showed that a period of only five days is required for the invasion and disintegration of thick stems. The disease spread eight miles in four days.

Lorenz (H.). **Stagonospora crini an Hippeastrum (Amaryllis).** [*Stagonospora crini* on *Hippeastrum* (*Amaryllis*).]—*Gartenflora*, lxxxiii, 7, p. 188, 1934.

Stagonospora crini spread from infected corms of *Amaryllis*

[*Sprekelia*] *formosissima* and *Sternbergia lutea* [*S. citrina*] to adjacent plants of *Hippeastrum* hybr. (*A. vittata*) [*R.A.M.*, x, p. 189]. When planted out in a cold frame the leaves and corms of the two-year-old seedlings developed elliptical, cinnamon-red lesions which assumed a verrucose form and caused the rupture of the epidermis. The most severe injuries occurred at the leaf insertions and necks of the corms. The conidia of the fungus are disseminated by sprinkling water and snails. Control can only be effected by keeping the hot-beds dry.

White (R. P.) & McCulloch (Lucia). **A bacterial disease of Hedera helix.**—*Journ. Agric. Res.*, xlviii, 9, pp. 807–815, 2 pl., 1934.

A brief account is given of a bacterial leaf spot and stem canker of ivy (*Hedera helix*) which was first observed in the United States in 1930 in a consignment received in New Jersey from Maryland, and was also reported in 1932 by Burkholder and Guterman and attributed by them to *Phytomonas hederae* [*R.A.M.*, xii, p. 97]. The authors agree that in its symptoms the disease is identical with that described in 1920 from France by Arnaud (*Comptes rendus Acad. des Sciences*, clxxi, pp. 121–122, 1920), who named the causal organism *Bacterium hederae*, and previously in Germany by Lindau (*Zeitschr. f. Pflanzenkr.*, iv, p. 1, 1894). Arnaud's name is retained by them, although he failed to describe his organism or to report pathogenicity trials with it, the latter being, however, successfully done by Killian in 1921 (*Comptes rendus Soc. de Biol.*, lxxxiv, p. 224). Details are briefly given of inoculation experiments which showed that the bacterium is pathogenic to 12 horticultural varieties of the ivy, entrance by it into the host tissues being evidently gained through the stomata. The morphological, cultural, and physiological characters of *Bact. hederae* are fully described, and a technical diagnosis in English is appended; the index number (Soc. of American Bacteriologists) is 5322-3115-1222.

The organism was always isolated in pure culture from young diseased areas on the ivy, but isolations from old spots also yielded ten species of associated bacteria, one of which (of unestablished identity) was shown to have a synergistic action on *Bact. hederae*, whereas the nine other species had an anergistic action.

The paper terminates with some suggestions for the possible control of the disease.

Yarwood (C. E.). **The comparative behaviour of four Clover-leaf parasites on excised leaves.**—*Phytopath.*, xxiv, 7, pp. 797–806, 3 figs., 1934.

Methods for the culture of four parasitic fungi on excised red clover (*Trifolium pratense*) leaves, viz., *Uromyces fallens* [*R.A.M.*, viii, p. 176], *Erysiphe polygoni* [ibid., xiii, p. 460], *Macrosporium* [or *Thyrospora*] *sarcinaeforme* [ibid., xiii, pp. 14, 327, 520], and *Colletotrichum trifolii* [ibid., xiii, p. 382], are described and discussed.

Leaflets maintained in a vigorous state by floating on 10 per

cent. sucrose solution were more susceptible to the two first-named fungi and less so to the two last than those floated on 2 per cent. sucrose or on water. Leaflets removed from the plant in the late afternoon were more vigorous, and showed greater susceptibility to *U. fallens* and *E. polygoni* and less to *M. sarcinaeforme* and *C. trifolii* than those cut in the early morning. Young excised leaflets were more vigorous, more susceptible to *E. polygoni*, and less so to *M. sarcinaeforme* and *C. trifolii* than older ones.

Excised clover leaflets artificially infected with *E. polygoni* were found very convenient for culturing *Cicinnobolus cesatii* [ibid., xi, p. 377].

Jones (F. R.). **Testing Alfalfa for resistance to bacterial wilt.**—*Journ. Agric. Res.*, xlviii, 12, pp. 1085–1098, 1934.

Brief details are given of three years' experiments at Madison, Wisconsin, in which the author tried various methods for testing in one year the resistance of lucerne varieties to bacterial wilt (*Phytomonas insidiosa*) [*Aplanobacter insidiosum*], the results of which showed that his previously described method [*R.A.M.*, ix, p. 788] best combines convenience and efficacy. While the investigation again confirmed the supremacy in resistance of the Turkestan and Ladak varieties [cf. also ibid., xiii, p. 582] among the varieties tested so far, highly resistant plants have occasionally been found in the progeny of the latter, and subsequent tests of these showed that they might be either immune, highly resistant, or resistant.

Experiments to elucidate the nature of this resistance indicated that it is apparently largely exhibited by the parenchymatous tissues, through which, in resistant plants, the bacteria make little or no progress and so fail to reach the phloem or xylem, but it is also dependent to a certain extent on the fact that the bacteria multiply somewhat less rapidly in the vessels of the resistant plants. There was no evidence of morphological differences between resistant and susceptible plants as reported by Peltier and Schroeder [ibid., xii, p. 221]. Finally, the work showed an increase in resistance in open-pollinated progeny from some of the plants selected for resistance.

Richards (B. L.). **Reaction of Alfalfa varieties to stem blight.**—*Phytopath.*, xxiv, 7, pp. 824–826, 1 diag., 1934.

In 1933 a series of experiments was carried out at Logan, Utah, to determine the relative susceptibility to stem blight of a number of American and foreign lucerne varieties. The disease is generally referred, on Sackett's authority (*Colorado Agric. Exper. Stat. Bull.* 159, 1910) to *Pseudomonas* [*Bacterium*] *medicaginis* [*R.A.M.*, xii, p. 177], but the writer has consistently isolated a species of *Phoma* from infected material [cf. ibid., xiii, p. 32]. Ladak (South Dakota) proved extremely resistant, with a susceptibility coefficient of only 0·15 per cent., closely followed by Hardigan 18999 (0·21) and Grimm Lat. (0·37), while other varieties showing under 1 per cent. infection included Hardigan Idaho, Grimm Idaho, Cossack 10643, Grimm Utah, and Sask. 666. The highest degree of susceptibility was manifested by French 18829 (2·20 per cent.), followed

by Russian 19305 (2·15), Russian 80909, Turkestan 19316, and French 19275 (all 2·10).

Bird (J. N.). **Influence of rust injury on the vigour and yield of Timothy.**—*Scient. Agric.*, xiv, 10, pp. 550–559, 1 fig., 2 graphs, 1934. [French summary.]

This is a brief, tabulated account of the results of observations in 1933 of the effect on the vigour and yield of the host of a severe natural outbreak of rust (*Puccinia graminis phlei-pratensis*) [*R.A.M.*, xi, p. 628] during the late summer of 1932 in a plantation of 116 American and European timothy [*Phleum pratense*] strains, at Macdonald College, Quebec. The great majority of improved strains (including Gloria from Sweden and Ødtofte from Denmark) tested showed marked resistance to the rust, and gave a clear-cut demonstration of the importance of careful selection for rust resistance. No strains, however, were found to be entirely immune. Not only did the strains vary widely in their reaction, as measured by the vigour and yield of the plants in 1933, but the reaction of individual plants within the same strain also showed considerable variation. In a large proportion of the strains there was a regular gradation of rust injury from no apparent trace of the disease to almost complete killing. For these increasing grades of rust injury (represented by degrees from 0 to 5) the average green yields for 28 of the strains were 18·4, 15·3, 7·4, 4·7, 2·2, and 0·9 oz. respectively, and for the common 'check' strain 17·7, 13·9, 8·0, 4·6, 2·5, and 1·7 oz., respectively. A comparison of the variance in yield per plant for these 28 strains, between and within the grades of rust injury, indicated the statistical significance of rust injury as a factor influencing the yield of timothy.

Yu (T. F.). **Notes on the storage and market diseases of fruits. I.**—*Contrib. Plant Path. Lab., Bot. Dept., Univ. of Nanking*, 25, 12 pp., 12 figs. [? 1934. Chinese summary.]

An annotated list, based on work carried out since 1932, is given of 27 fungi associated with rotted fruits in storage and on the market in China, of which the following may be mentioned. Stem-end rot of oranges (*Diplodia natalensis*) [see above, p. 763] appears to be widely distributed, the same host being also extensively infected in fruit from the Chekiang province by *Alternaria citri* [*R.A.M.*, xii, p. 215]. Black spot (*Phoma citricarpa*) [ibid., xiii, p. 219] is another common disease of oranges, but causes little market wastage. *Trichoderma lignorum* [ibid., ix, p. 106] was occasionally found rotting market oranges. Pears (*Pyrus ussuriensis* Maxim.) are liable to rotting by *A. gaisen* Nagano [published without diagnosis but stated by Tanaka to be identical with his *A. kikuchiana*: ibid., xii, p. 768]. Foreign pears (*P. communis*) at Nanking were attacked in a destructive form by *Macrophoma* sp., which causes a canker of the trunk and twigs. It was observed on Bartlett and Kieffer pears in the University garden. In storage it produces small, brown to black spots which are sometimes concentrically zoned. Dry rot of pomegranates (*Punica granatum*) caused by *Zythia versoniana* [ibid., xii, p. 641] is an important field and storage disease.

May (E.). **Was kosten die Sommerspritzungen?** [What do summer sprays cost?]—*Die Kranke Pflanze*, xi, 7–8, pp. 88–90, 1934.

Some figures are given of the costs of summer spraying against fruit diseases and pests in Germany. Hercynia-neutral [*R.A.M.*, xii, pp. 32, 297] is used at the rate of 300 gm. per 100 l. water, so that the cost of 100 l. of mixture, reckoning M. 2·50 as the price per kg., is Pf. 75, which may be reduced to Pf. 66 when purchased in bulk. The price of 1·5 kg. of nosprasit '0' [ibid., xii, pp. 233, 745, *et passim*] is M. 3·05, so that the cost of 100 l. of mixture amounts to rather more than M. 1. The advantages of a mixture of lime-sulphur and lead arsenate for use on the foliage of apple varieties liable to scorching from copper sprays is stressed. The superior brands of lead arsenate, viz., Borchers, blarsenat, urania [ibid., xi, p. 169], and zabulon are all the same price (M. 1·80 per kg.), working out at Pf. 72 for the requisite quantity of 400 gm. per 100 l.; with the addition of 2 l. lime-sulphur at M. 4 per 10 l. the total cost of 100 l. of the mixture is M. 1·52.

Ark (P. A.). **Dissociation in Erwinia amylovora (Burrill) Comm. S.A.B.**—*Science*, N.S., lxxx, 2062, p. 20, 1934.

The 'rough' type of colony was obtained in *Erwinia amylovora* [*Bacillus amylovorus*: *R.A.M.*, xiii, p. 707] by growing the 'smooth' form in common nutrient broth at P_H 6·9 for 20 days at 12° to 25° C., and also by daily transference at 18-hour intervals into bouillon at P_H 6·9 and incubating at 28°. The rough colonies were large, flat, wrinkled, and dull, forming clumps on suspension in 0·85 per cent. sodium chloride solution. The individual bacteria were only moderately motile in comparison with those of the smooth colonies; their pathogenicity to pear was slight and they were innocuous to certain shrubs liable to severe damage from the smooth type. Rough and intermediate types were isolated from old natural apple, pear, and shrub infections. The reversion of rough to smooth took place in 2 per cent. sucrose or 1 per cent. dextrose bouillon after four to six transfers, the organism being attenuated, on the other hand, by sucrose concentrations of 10 per cent. or above.

Hildebrand (E. M.). **Life history of the hairy-root organism in relation to its pathogenesis on nursery Apple trees.**—*Journ. Agric. Res.*, xlviii, 10, pp. 857–885, 3 figs., 2 graphs, 1934.

After a brief description of isolation and inoculation experiments, the results of which confirmed the differentiation of the apple hairy root organism (*Phytomonas* [*Bacterium*] *rhizogenes*) from *Bact. tumefaciens* [*R.A.M.*, x, p. 166; xiii, p. 521], the author gives a detailed account of his studies of the life-history of the former in relation to its pathogenicity on nursery apple trees, and on certain other plants in the greenhouse, including Paris daisy [*Chrysanthemum frutescens*], bean, sugar beet, and *Sedum spectabile*. The results showed that *Bact. rhizogenes* gains entry into the host tissues exclusively through wounds, the nature of which

did not appear to influence much the kind of overgrowth produced, but did have a certain bearing on the length of the incubation period, the percentage of successful infections, and the extent of the reaction; very shallow wounds proved to be poor infection courts. The time during which wounds on the underground stems of nursery apple trees remained liable to infection was found to average about two days, callus tissue usually forming a barrier against invasion by the organism.

Field observations, supported by a special series of experiments, suggested a close relationship of insects to hairy root infection. Root-eating insects, especially white grubs (*Phyllophaga*) and wireworms (Elateridae) were frequently found feeding on healthy and hairy root tissue, and the causal bacteria were isolated from the white grubs, though not from the other species. In preliminary trials the amount of hairy root infection was considerably reduced by the application of insect repellents or insect barriers. The time of the season, as well as the age and size of the nursery trees in Kansas, where the trees are grown for only two years in the nursery, did not seem to influence susceptibility to infection either in nature or under controlled conditions. Varietal susceptibility varied widely, ranging from 12 to 100 per cent. in the 29 varieties of apples tested in 1930, and from 22 to 100 in the 37 varieties tried in 1931. Previous infection did not appear to immunize the trees against subsequent attack.

Histological studies appeared to indicate that *Bact. rhizogenes* developed in the liquid exuded from the wounds, the bacteria then becoming located in the intercellular spaces (both in Paris daisy and apple stems), where their presence stimulated the formation of somewhat circular areas of hyperplasia. The bacteria were found to be abundant on the surface of the hairy root enlargements, and were isolated from the surface and subsurface parenchymatous tissues of these swellings; they were also found frequently in the soil near by. The longevity of the bacteria in steamed or untreated field soil exceeded one year. There was also evidence that the bacteria may be disseminated by shipments of nursery stocks, and surface washings from seedling roots yielded the organism.

Riker (A. J.) & Hildebrand (E. M.). **Seasonal development of hairy root, crown gall, and wound overgrowth on Apple trees in the nursery.**—*Journ. Agric. Res.*, xlviii, 10, pp. 887–912, 3 figs., 5 graphs, 1934.

This is a detailed account of the authors' study during the widely different growing seasons of 1929, 1930, and 1931 in Kansas of the seasonal development of crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) and hairy root (*P.* [*Bact.*] *rhizogenes*) [see preceding and next abstracts], induced by inoculations with single-cell cultures of the causal organisms, and of wound overgrowths induced by wire girdles or knife cuts on apple (Yellow Transparent) nursery trees. A brief description is given of the successive stages in the development of these several proliferations to assist in their differential diagnosis. The incubation periods of crown

gall and hairy root were relatively long in the spring and autumn, and relatively short during the summer, suggesting a correlation with temperature and with active growth of the trees. Both conditions developed in piece-root grafted trees which were inoculated at grafting time, and adhesive tape wrapped around the unions only slightly delayed the appearance of the symptoms but did not reduce the number of successful infections. In uninoculated grafts adhesive tape wrappers prevented the entrance of the bacteria from the soil so long as they remained intact.

Under conditions of natural infection, various mixtures of the three types of outgrowths occurred, especially on second year trees, crown gall being of minor importance. A relatively small amount of hairy root infection occurred at grafting time, but it is believed to have been important as a source of inoculum for subsequent infections, which often increased in number with the age of the planting. It is pointed out that the studies were made in a place where infectious hairy root is prevalent, and consequently deal with severe rather than with average conditions.

Riker (A. J.), Keitt (G. W.), Hildebrand (E. M.), & Banfield (W. M.). **Hairy root, crown gall, and other malformations at the unions of piece-root-grafted Apple trees and their control.**—*Journ. Agric. Res.*, xlviii, 10, pp. 913–939, 2 diags., 1934.

This is a summarized account of studies which were made during several years in seven of the mid-western United States for the purpose of finding a means of reducing the severe losses caused by crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*), infectious hairy root (*P.* [*Bact.*] *rhizogenes*), and various types of wound overgrowths [see preceding abstracts], in apple nurseries where for reasons of economy preference is still given to piece-root grafting over budding. Observations in the nurseries showed the occurrence of various kinds and degrees of mixtures of these different categories of proliferations, most of which appeared at or near the graft union, crown gall being apparently of minor importance. There often appeared to be a direct correlation between the length of time the trees remained in the nursery row and the percentage of overgrowths. In some districts wound overgrowths frequently became infected subsequently with *Bact. rhizogenes*. In some cases the development of hairy root was traced to infection of the seedling roots at grafting time, especially when such roots were grafted in a moist and dirty condition, but in others this factor appeared to be of relatively little importance. Experiments showed that trees with infectious hairy root usually made slightly less growth than the controls, although the abnormally developed roots were shown to be able to keep the trees alive for at least one season after the removal of all the other healthy roots.

The use of stocks grown from the seed of relatively resistant apple varieties gave promise of being a factor of some importance in the control of the graft proliferations, and a measure of control appeared also to be afforded by antiseptic treatment of seedlings carrying the pathogenic bacteria. Adhesive tape wrappings

around the grafts [loc. cit.] appeared to give better protection than any other of the wrappings tested against the entry of the bacteria from the soil (although they did not prevent infection at the time of grafting), and to be the most important single factor among control measures. Planting in soil treated so as to render it relatively free from root-eating insects is also recommended as a measure tending to minimize the incidence of the different overgrowths.

Goodwin (W.), Martin (H.), Salmon (E. S.), & Ware (W. M.). **The control of Apple scab: Allington Pippin and Newton Wonder, 1933.**—*Journ. South-Eastern Agric. Coll., Wye, Kent*, xxxiv, pp. 136–144, 1934.

In further comparative spraying tests against apple scab [*Venturia inaequalis*: *R.A.M.*, xiii, p. 104] conducted in Kent in 1933, Allington Pippin and Newton Wonder trees received two pre- and two post-blossom applications either of home-made Bordeaux mixture (8:12:100) or of an emulsion prepared by adding simultaneously 6 pints of cotton-seed oil (to give a concentration of 0·75 per cent.) and 4 galls. of 10 per cent. copper sulphate solution to 95 galls. of water containing 6 lb. of hydrated lime. The oil emulsified readily without forming the green scum observed with the mustard oil wash previously used [loc. cit.].

The results obtained [which are tabulated and fully discussed] showed that in the unsprayed Allington Pippin control plots the scab-free apples averaged 19·2 per cent. of the crop, the corresponding figures for the plots sprayed with Bordeaux mixture and the emulsion being 92·2 and 92·8 per cent. In the Newton Wonder control plots the scab-free apples averaged 7·6 per cent. of the crop, the corresponding figures for the plots treated with Bordeaux mixture and the emulsion being 60·9 and 64·4 per cent.

The Allington Pippin trees sprayed with Bordeaux mixture showed 9·15 per cent. of the total crop and 9·92 per cent. of the grade 1 apples russeted, the corresponding figures for the trees sprayed with the emulsion being 4·85 and 4·93 per cent.; with the Newton Wonder trees the figures were, respectively, 2·93 and 3·81 per cent. for the Bordeaux mixture, and 0·70 and 0·95 per cent. for the emulsion.

Estimations of the amount of copper retained expressed as milligrams of metallic copper per sq. m. of leaf surface showed that the spray deposits given by the Bordeaux mixture and the emulsion were comparable in copper content; in fact, the amounts of copper retained on the foliage sprayed with the emulsion were greater after one or two months than those retained on the foliage sprayed with Bordeaux mixture.

The cotton-seed oil-Bordeaux mixture is considered to deserve trial on an extended commercial scale as it is as fungicidal as Bordeaux mixture, causes less russeting, and can be applied speedily as a heavy wash in which insecticides can be incorporated.

The constantly heavier infection noted on the Newton Wonder trees each year in the tests suggests that a specialized form of the fungus may attack this variety [cf. ibid., x, p. 464; xi, pp. 48, 461].

Crowell (I. H.). **The hosts, life history, and control of the Cedar-Apple rust fungus Gymnosporangium juniperi-virginianae Schw.**—*Journ. Arnold Arboretum*, xv, 3, pp. 163–232, 8 pl., 2 maps, 1934.

A comprehensive, fully tabulated account is given of the writer's inoculation experiments at the Arnold Arboretum of Harvard University on 108 species of 11 related genera of Rosaceae with *Gymnosporangium juniperi-virginianae* from Massachusetts [*R.A.M.*, xiii, p. 383].

All the 16 species and varieties of the section *Chloromeles* of the genus *Malus* [*Pyrus*], together with *M.* [*P.*] *fusca* and *M. sylvestris* [*P. malus*], produced aecidia as a result of inoculation with the teleutospores of the rust. Twelve species and varieties belonging to other sections of the genus produced spermogonia only, while the remaining 47 species and varieties of *Malus* and all others tested or observed were found to be immune. An examination of the genus *Juniperus* in the Arboretum showed that *J. virginiana* and twelve varieties, *J. scopulorum*, and *J. horizontalis* (each with two varieties) are susceptible to *G. juniperi-virginianae*, the remaining 52 species and varieties being immune.

A peculiar phenomenon associated with infection by *G. juniperi-virginianae*, apparently only in certain wild apples, such as *P. ioensis plena* and *P. soulardi*, is the forced growth of buds, of which this is believed to be the first description. The infected buds became much swollen and commenced growth. The diseased twigs increased greatly in diameter but very little in length, while the leaves expanded irregularly and were uniformly thickened, pale green, and tomentose. The spermogonia, followed by aecidia, first appeared at the pedicel bases, whence they spread to the petioles and leaves.

The results of an analysis of teleutospore material from eight States indicated the existence of biologic strains.

A number of constitutional and environmental factors are discussed in relation to their influence on the reaction both of apples and red cedars to *G. juniperi-virginianae*. As regards control of the disease, it appears that the cedar eradication law in all of the north-eastern States is no longer generally enforced, and in the light of present information on resistance and susceptibility it may be possible to maintain satisfactory stands of orchards and ornamental apples without sacrificing the alternate host. Four to five applications of Linco colloidal sulphur (0·5 per cent.) gave promising results in the control of the rust on apples under experimental conditions.

Baker (K. F.) & Heald (F. D.). **An investigation of factors affecting the incidence of lenticel infection of Apples by Penicillium expansum.**—*Washington Agric. Exper. Stat. Bull.* 298 (*Tech. Paper*), 48 pp., 1934.

This is a fully tabulated account of the authors' field and laboratory experiments in 1930–4 in Washington State to determine the chief factors affecting lenticel infections of apples with blue mould (*Penicillium expansum*) [*R.A.M.*, xii, p. 226]. In the Yakima and

Wenatchee valleys some of the ranches supply apples severely affected with the trouble every year, while in others the losses are occasional. Infection is governed by the following main factors in decreasing order of importance: (1) susceptibility of the lenticels to invasion by *P. expansum*; (2) density of spore load on the surface of the fruit; and (3) conditions influencing the process of infection. Of these only the first two are believed to be limiting factors under commercial conditions.

The susceptibility of the lenticels to infection appeared to be conditioned by many factors, among which delayed picking, various types of bruises, and storage of the apples at 0° C. previous to washing in heated (43° to 49°) solutions [loc. cit.] increased susceptibility, while holding the fruit in the orchard (especially under dry conditions) prior to storage usually decreased it; treatment with dry heat decreased susceptibility in every case. H. F. Clements's unpublished method of immersing the apples in an aqueous solution of methylene blue for two or three days shows by the extent of the penetration and diffusion of the dye the degree to which the cavity of the lenticels is suberized or cutinized and thus protected against the advance of the fungus.

Of the four factors which may stimulate the germination of the spores on the surface of the fruit, namely, the volatile products of the apples, exosmosis of nutrients through the uncutinized lenticel cells, juice from adjacent decayed fruit, and the acidity of the moisture on the surface, the first alone is thought to be important under commercial conditions. A series of tests indicated, however, that besides stimulating spore germination, the tissue of decayed apples contains enzymes which by their action on the uncutinized cells of the lenticels facilitate the penetration of the latter by *P. expansum*, and thus increase the susceptibility of apples lying in direct contact with rotted fruit to lenticel infection.

On the whole, the investigation failed to disclose any single factor in the growers' control sufficient to account for the high percentage of blue mould decay frequently found in commercial lots, but as many of the conditions now known to predispose to lenticel infections as practicable should be avoided. Cold storage is valuable only inasmuch as it retards the development of the *P. expansum* rot; it does not, however, prevent either infection of the lenticels or mechanical injuries which are good infection courts when the fruit is returned to normal temperatures.

Baker (K. F.) & Heald (F. D.). **Investigations on methods of control of the blue-mold decay of Apples.**—*Washington Agric. Exper. Stat. Bull.* 304, 32 pp., 1934.

Further investigations [which are described, and the results of which are tabulated and discussed] conducted in Washington into the control of blue mould of apples (*Penicillium expansum*) [see preceding abstract] showed that contamination of the picking boxes and packing equipment [*R.A.M.*, xii, p. 295] increases greatly during harvest time and to a less extent from season to season; these articles should be sprayed with a sodium hypochlorite solution containing 0·4 per cent. available chlorine. Rinsing the apples for at least one minute in the same solution after washing

very effectively reduced infection on the surface of the fruit and in the lenticels [ibid., xi, p. 658], decreasing the decay also at punctures and other points of entry. The treatment was non-injurious, and the flavour and appearance of the fruit remained unimpaired.

The sterilization of storage rooms, bins, &c., with copper sulphate was not effective, and sodium bicarbonate, sodium tetraborate, and sodium carbonate were insufficiently fungicidal to *P. expansum* to be of use in the treatment of the fruit.

A bibliography of 38 titles is appended.

Banga (O.). **Het 'steelrot' van Appels.** [The 'stalk rot' of Apples.]—*Tijdschr. over Plantenziekten*, xl, 7, pp. 157–169, 1 pl., 1934. [German summary.]

Undetermined species of *Phomopsis* [*R.A.M.*, xii, pp. 32, 573] and *Cylindrocarpon* [cf. ibid., x, p. 626] were isolated in the Betuwe district of Holland during the winter of 1932–3 from stored apples (Golden Pippins) affected by a rot beginning at the stalk and gradually involving the entire fruit. The infected tissues were completely permeated by hyphae. Inoculation tests showed that the fungi under observation are incapable of penetrating the skin of the fruit except through wounds. It was found that infection normally occurs through the stalk after the latter has dried up, and the hyphae then pass into the fruit so that the dried stalk comes to be inserted in the centre of the rotted basal area. Premature harvesting is believed to be an important factor in the etiology of this stalk rot, as the withering of the stalks of green apples was more rapid and more frequently followed by rotting than in apples harvested when mature or nearly mature.

Hockey (J. F.) & Boyle (J. A.). **Gravensteins—time of picking in relation to spot scald.**—*Scient. Agric.*, xiv, 11, pp. 608–613, 2 figs., 1934. [French summary.]

When Banks Gravenstein apples picked at weekly intervals were placed in ventilated storage the least spot scald [*R.A.M.*, xii, p. 299] developed in the fruit gathered when most of the starch had disappeared from the core area but an appreciable amount remained in the flesh. The quantity of sucrose and total sugars present had practically no effect on the prevalence of the disease. Harvesting when most of the starch had disappeared from the core area gave larger, better coloured, better-keeping fruit than earlier picking. The iodine-potassium iodide test for starch [cf. ibid., viii, p. 252] was superior to a mechanical pressure tester for determining the picking maturity in apples ripening about the same time as Gravensteins.

Martin (H.), Salmon (E. S.), & Ware (W. M.). **Spraying experiments against Pear scab.**—*Journ. South-Eastern Agric. Coll., Wye, Kent*, xxxiv, pp. 145–154, 1 fig., 1934.

In a comparative spraying test carried out in Kent against scab [*Venturia pirina*: *R.A.M.*, xii, pp. 767, 774] Marguérite Marillat and Williams's Bon Chrétien pear trees were given one pre- and either two or three post-blossom applications of Bordeaux mixture

(8 : 12 : 100) or of an emulsion composed of 4 lb. copper sulphate, 6 lb. hydrated lime, and 6 pints Sudanese cotton-seed oil in 100 galls. water [see above, p. 779].

The two plots of the former variety receiving two post-blossom applications of Bordeaux mixture gave, respectively, 3·4 and 10·2 per cent. scabbed pears, as against 1·4 and 5·2 per cent. for those receiving three, while those receiving two post-blossom applications of the emulsion gave 6·7 and 3·8 per cent. scabbed fruits, respectively, as against 1·7 and 2·8 per cent. for those receiving three; the unsprayed control plot had 79·4 per cent. scabbed fruits. The corresponding figures for the Bon Chrétien trees were 49·1, 38·1, 8·8, and 15·1 per cent. for the Bordeaux mixture and 46·2, 14·8, 5·7, and 13·2 per cent. for the emulsion, as against 79·2 per cent. for the unsprayed controls.

The improvement in scab control resulting from three post-blossom applications as compared with two was statistically significant and was greater on Bon Chrétien than on Marguérite Marillat. The Bordeaux emulsion was as effective a fungicide as the plain Bordeaux mixture.

No appreciable russeting was caused on Bon Chrétien fruits by either spray, but the Bordeaux mixture produced slight roughness of the skin on Marguérite Marillat fruits. Both sprays caused some damage to the foliage of the latter variety and to that of Doyenné du Comice.

The conidial (*Fusicladium*) stage was found, often in abundance, on the young wood and spurs of Louise Bonne and Doyenné du Comice pears and on the young wood, spurs, and on one bud-scale of Bon Chrétien.

CURZI (M.). **Una grava infezione da 'Phytophthora' dei Peschi.** [A severe infection of Peaches by *Phytophthora*.] —*Rendic. R. Accad. Lincei*, xix, Ser. VI, 11, pp. 817–820, 1934.

Three-year-old peach trees growing in a siliceous clay soil near Rome were recently observed to show a wilting of the foliage accompanied by necrosis of the base of the stem, the soil around which was stained dark blue, probably as a result of the exudation of tannic substances from the injured cortex such as occurs in ink disease of chestnut and walnut (*Phytophthora cambivora*) [*R.A.M.*, xiii, p. 603]. The diseased cortex emitted a slightly acid, pungent odour and the underlying wood showed a brown discoloration extending slightly beyond the limits of the surface necrosis. The wood was invaded by secondary fungi, but towards the upper limiting zone of infection the actual agent of the disease was detected in the shape of two types of *Phytophthora*, designated *α* and *β*.

Type *α* formed neither sporangia nor oospores in any of the nutrient media used, but in water piriform sporangia, without a terminal papilla were produced, measuring 43 to 53 by 30 to 33 *μ* (42 to 45 by 20 to 25 *μ* on the surface). An affinity with *P. syringae* [ibid., xi, pp. 111, 579] appears to be indicated, but unlike that species, the peach pathogen develops at 23° to 25° C. and was found capable of attacking potato tubers. This was the type isolated from the majority of the infected trees, but one yielded quite

a different organism (β), characterized by profuse oospore formation in most media. These bodies are spherical, 25 to 43 μ in diameter (mostly 34 to 38 μ), with a smooth, hyaline or pale yellow wall, 2 to 3·75 μ in thickness. They are produced in spherical oogonia, 30 to 50 μ in diameter (40 to 46 μ), provided with paragynous, globose or piriform antheridia, measuring 13 to 17 by 10 to 14 μ. The sporangia (formed in water) are lemon-shaped, apiculate, and measure 32 to 75 by 12 to 30 μ (43 to 53 by 20 to 25 μ); they germinate readily by the emission of typical biciliate zoospores, 11 to 13 μ in diameter. The more frequently the water was changed, the more profuse was sporangial development in both these types of *Phytophthora*, a fact supporting the writer's belief that infection was spread by running water on the surface of the soil [cf. ibid., vi, p. 333]. Type β falls into the *cactorum* group [ibid., xiii, pp. 213, 585], differing from the Californian strain [ibid., xi, p. 339], however, in its abundant oospore development on nutrient media, its failure to form sporangia on such substrata, and its somewhat larger oogonia and oospores.

The writer believes that the *Phytophthora* disease of peaches is serious and common in Italy, where it has hitherto been confused with other infectious troubles or attributed to adverse climatic conditions. The fungus gains entry to the tissues during the dormant period from October to the spring, stagnant moisture at the base of the tree being favourable to infection. Good results have been given by decortication and the application of 3 to 5 per cent. Bordeaux mixture to the stems, root collar, and surrounding soil.

Howells (D. V.). **Strawberry culture. II.**—*Scottish Journ. of Agric.*, xvii, 3, pp. 287–293, 1934.

The strawberry varieties principally affected by the red core or Lanarkshire disease (*Phytophthora* sp.) [allied to *P. cinnamomi*: *R.A.M.*, xiii, p. 76] in April and May are those with luxuriant foliage, such as Royal Sovereign, Oberschlesien, and Ruskin. A partial revival of growth after the middle of June is liable to create a false impression of permanent recovery; a protracted wet spell in late July or August may be followed by extensive autumn spread of the disease and noticeable winter killing. Under field conditions the red core disease attains its maximum intensity from May to early June and from September to the middle of October, these periods coinciding with those of most profuse root formation. Young plants infected by the fungus frequently collapse much more rapidly than old ones, the requirements of which in food and water are less exacting. In a given strain of plants the disease appears to be cumulative, increasing in severity in each generation of runners taken, so that ultimately total failure occurs even in maiden plantations. It is obvious, therefore, that the chief means of control lies in the avoidance of diseased stock for planting, supplemented by thorough field sanitation; eventually the situation may be saved by the development of immune varieties.

Yellow edge [ibid., xiii, pp. 563, 642] appears to have become fairly well established in Scottish strawberry plantations of recent

years. Most of the infections are stated to be traceable to imported English material.

Truscott (J. H. L.). **Fungous root rots of the Strawberry.**—*Canadian Journ. of Res.*, xi, 1, pp. 1–17, 4 pl., 1 fig., 1934.

Two years' investigations in Ontario showed that the primary parasites as established by successful inoculations [which are briefly described] associated with strawberry root rot [*R.A.M.*, xi, pp. 250, 251; xiii, pp. 173, 454] were of the following genera: *Pythium*, *Fusarium*, *Alternaria*, *Ramularia*, *Rhizoctonia*, *Verticillium*, and *Cylindrocladium*. Three additional forms found were *Asterocystis*, a Plasmodiophoraceous fungus apparently related to *Spongospora*, and the mycorrhizal Phycomycete with vesicles and arbuscles [ibid., iv, p. 301; vii, p. 524]. As a similar root flora was found in wild strawberry roots most of the organisms are probably indigenous.

A bibliography of 25 titles is appended.

Hildebrand (A. A.). **Recent observations on Strawberry root rot in the Niagara Peninsula.**—*Canadian Journ. of Res.*, xi, pp. 18–31, 2 pl., 1 fig., 1934.

Fungi of about 20 different genera were isolated in the Niagara Peninsula from 684 diseased strawberry roots [see preceding abstract], ranging in frequency of occurrence from 0·4 (*Gliocladium*) to 32·7 per cent. (*Fusarium*), the figures for *Ramularia* and *Pythium* being 28·5 and 10·8 per cent., respectively. Some of the species appeared to be restricted in their distribution while others, such as *Fusarium*, *Ramularia*, *Penicillium*, *Hainesia*, and *Coniothyrium*, were more widespread. Nine different genera were found on 125 apparently healthy rootlets on diseased roots, the frequency of occurrence ranging from 1·6 (*Alternaria*) to 4 (*Fusarium*) and 5·6 per cent. (*Ramularia*). Practically all of 550 roots of wild and cultivated strawberries showed two endotrophic mycorrhiza, sometimes together, much the commoner being of the phycomycetoid type, while the other was of the *Rhizoctonia* type [*R.A.M.*, xii, p. 312]. Resting spores of *Asterocystis* [ibid., iii, p. 539] and the spherical, smooth-walled spores of a member of the Plasmodiophoraceae were observed on diseased rootlets early in the season, and *Pythium* was abundant on roots obtained in the field in September and November. In experiments in which a pair of runners from 75 plants were trained, one into sterilized soil and the other into soil naturally infested with root rot, the runners being quite healthy at the beginning of the experiment, the former set yielded healthy vigorous plants and the latter degenerated, stunted ones with more or less diseased root systems. Stolons from the latter trained over sterilized soil produced healthy plants so that the 'degeneration' does not appear to pass along the stolon.

A bibliography of 13 titles is appended.

Plakidas (A. G.). **Control of Strawberry leaf blights in Louisiana.**—*Louisiana Agric. Exper. Stat. Bull.* 252, 17 pp., 5 figs., 1934.

Most of the information given in this bulletin [which is a revision

of *Louisiana Agric. Exper. Stat. Bull.* 225] on strawberry leaf spot (*Mycosphaerella fragariae*) and scorch (*Diplocarpon earliana*) and their control in Louisiana has already been noticed from other sources [*R.A.M.*, xii, p. 679; xiii, p. 712]. Applications of 4-4-50 Bordeaux mixture at ten-day intervals from January to early March gave almost complete control and neither injured the open blossoms nor interfered with pollination.

BANFIELD (W. M.). **Life history of the crown-gall organism in relation to its pathogenesis on the red Raspberry.**—*Journ. Agric. Res.*, xlviii, 9, pp. 761–787, 4 figs., 2 graphs, 1934.

This is a full account of the author's investigation, a preliminary report of which has already been noticed from another source [*R.A.M.*, vii, p. 430], of important points in the life-history of *Bacterium tumefaciens* in relation to its pathogenesis on the red raspberry (*Rubus strigosus*) in the United States [ibid., xiii, p. 685]. In addition to the information already given, it was definitely shown that under suitable moisture conditions the organism is continuously given off into the soil from the surface of living crown galls, and is able to exist in a pathogenic state for at least 14 months in unsterilized soil in the absence of plants under nursery conditions. It was further found that it may be carried from the nursery to new areas in the form of incipient infections on the raspberry, which cannot be detected by macroscopical inspection of the canes. In artificially inoculated soil, infection occurs exclusively through wounds (root-feeding arthropods causing most of the injuries in infections observed by the author), at a practically uniform rate throughout the growing season of the host, injuries on the underground parts of red raspberry remaining open to crown gall infection for a relatively long period, occasionally up to seven weeks. The incubation period on the underground parts was found to vary from 11 to more than 28 days according to environmental conditions, chiefly seasonal.

PLAKIDAS (A. G.). **The rosette disease of Blackberries and Dewberries.**—*Louisiana Agric. Exper. Stat. Bull.* 250, 8 pp., 2 figs., 1934.

Experiments conducted in Louisiana showed that blackberry and dewberry [*Rubus* spp.] rosette (*Cercosporella* sp.) [*R.A.M.*, xi, p. 727; xii, p. 680; xiii, p. 454] may be controlled by removing, preferably in February, any rosette growth present before the blossoms open, pruning the primary canes to the ground about the first week in May, and spraying the new canes that develop from the time of pruning until the first week in June with 4-4-50 Bordeaux mixture at intervals of about ten days; two or three applications appear to be sufficient.

One of the chief symptoms is the characteristic alteration of the blossoms, which are elongated, with leafy calyx lobes and enlarged, pink petals that often fail to unfold. The stamens are arrested in growth and seldom mature their pollen; at a later stage they and the pistils are covered with a whitish powdery growth of the mycelium and spores of the fungus. Infection results from spores reaching the young buds of the new season's canes, the germ-tubes

penetrating to the meristematic tissue of the buds. If a terminal bud is infected all new lateral shoots contain the mycelium, but the infection of a lateral bud does not spread beyond the shoot arising from it. The rosette symptoms first become visible a year later.

STAHEL (G.). **The Banana leaf disease in Surinam.**—*Trop. Agriculture*, xi, 6, pp. 138–142, 2 pl., 1934.

This is an account of a leaf spot which was first noticed in 1933 in several experimental fields of Congo bananas [*Musa sapientum*] in different localities of Surinam. The severity of the outbreaks in the Surinam and Commewijne districts, in the first of which the disease entirely suppressed the production of fruit suitable for the market, while in the second the size of the banana bunches was significantly reduced, appears seriously to imperil the prospects for the commercial cultivation of the Congo banana, the introduction of which into Surinam was attempted because of its immunity from the Panama disease [*Fusarium oxysporum cubense*: *R.A.M.*, xiii, p. 586]. At the time of writing, the disease is stated to have spread in a more or less serious degree to all the varieties of *Musa*, even *M. textilis*, cultivated in Surinam.

Of the fairly numerous fungi associated with the leaf spot, only two species, namely, *Helminthosporium torulosum* [ibid., xii, p. 552] and *Cordana* [*Scolecotrichum*] *musae* [ibid., xiii, pp. 251, 455] were shown in inoculation experiments to be able to penetrate the unwounded leaf tissues. *H. torulosum* was proved to be a vigorous parasite. Its conidia under moist conditions germinate in about an hour and the germ-tubes form large appressoria four to six hours later, which give infection hyphae that penetrate into the epidermal cells after about 12 hours. Entry through the stomata was not observed, even when an appressorium is formed over a stoma. After entry the infection tube swells and forms several large, globular cells which fill the epidermal cell. The neighbouring cells are then killed in advance of penetration, indicating the secretion by the fungus of toxic substances. The water cells are entered after their death, and a new globular cell is immediately formed close to the pierced wall; from this several hyphae are sent across the water cell to enter the underlying palisade cells, on emerging from which the fungus then spreads unimpeded through the intercellular spaces of the mesophyll. Experimental infections were also obtained on the Governor [*M. cavendishii*] banana leaves.

S. musae proved to be a less vigorous parasite. Its two-celled conidia almost always germinate from the proximal pointed cell on the side wall near the septum, by the production of a comparatively short germ-tube which in about eight hours forms an appressorium. The underlying epidermal cell is entered several hours later and one or more large, globular cells develop in its lumen, the whole process requiring the presence of a film of moisture on the leaf surface for at least 12 hours. The fungus was shown to be able readily to penetrate the unwounded epidermal wall of all the leaves up to the thirteenth on the living plant, but it was not able to kill the large water cells by toxic secretions, like

H. torulosum, and therefore failed to enter the inner tissues of the leaf.

WARDLAW (C. W.). **Banana diseases. VIII. Notes on various diseases occurring in Trinidad.**—*Trop. Agriculture*, xi, 6, pp. 143–149. 6 pl., 1934.

Continuing his notes on banana diseases in Trinidad [*R.A.M.*, xiii, p. 455], the author gives a brief account of a recent localized outbreak of bacterial wilt (*Bacterium solanacearum*), of interest mainly because under the conditions of growth in the locality the Gros Michel variety exhibited a high degree of susceptibility to natural infection [cf. ibid., xiii, p. 713]. Moko and another variety of plantain [*Musa paradisiaca*] were attacked in the same plantation. The bacterial wilt is readily distinguishable from Panama disease [*Fusarium oxysporum cubense*] by the presence of a bacterial exudation from the diseased vascular bundles, and the yellow or brown colour of the latter instead of the reddish or crimson one characteristic of Panama disease. The fruit bunches were yellowed and the pulp at first became soapy and then dried up and crumbled, accompanied by rupturing of the skin.

Another pathological condition induced by bacteria but quite distinct from that caused by *Bact. solanacearum* and also from the blood disease described in the Dutch East Indies [ibid., i, p. 225] was observed in Dwarf Cavendish [*M. cavendishii*] fruits. The diseased bananas tend to be slightly irregular in shape, angular, small, and sometimes prematurely ripened, with a yellowish-brown to dark crimson discoloration of the pulp, the progress of the pathogen in lighter infections being traceable as a number of separate yellowish-brown streaks, extending from the stylar end, where infection always starts, to a greater or lesser distance towards the base. The organism, the exact identity of which has not yet been established, multiplies chiefly in the intercellular spaces in the fruit.

A Gros Michel × *M. acuminata* seedling banana at the Imperial College of Tropical Agriculture was affected during the 1933–4 rainy season by a disease chiefly characterized in plants attacked prior to the appearance of the bunch by a severe tip rot of the young unfolded central leaf, accompanied by a pronounced blackening of the tissue. This soon develops into a malodorous soft rot which works downwards into the pseudo-stem, finally rotting the apical tissues of the bulb. The condition is apparently caused by the joint action of a species of *Fusarium*, identified by Reinking and Wollenweber as *F. moniliforme* var. *subglutinans* [ibid., xiii, p. 240], the spore beds of which occur on the surface of the diseased tissues, and of an unidentified small, rod-shaped bacterium, which was consistently isolated from diseased tissues at all stages of infection.

A brief account is also given of a condition observed for a number of years on the Dwarf Cavendish and Giant Fig varieties, which is considered to be due to a virus disease. Affected leaves are characterized by a distinct mottling, occasionally extending over the entire leaf surface as light chlorotic linear areas composed of irregular, broken, sometimes anastomosing, lines or stripes running

from the midrib to the leaf margin. The condition in Trinidad does not appear so far to affect the general health or productivity of the plants, but in its early stages it bears a close resemblance to the destructive heart rot virus disease of bananas recently described from Australia by Magee [ibid., x, p. 472; xii, p. 201]. The evidence available is, however, insufficient to decide whether the two diseases are identical.

Tims (E. C.). **Stilbum on Fig in Louisiana.**—Abs. in *Phytopath.*, xxiv, 7, p. 843, 1934.

In cross-inoculation experiments *Stilbum cinnabarinum* from figs in Louisiana [*R.A.M.*, xii, p. 456] proved capable of attacking Pineapple pears [ibid., iii, p. 278; xii, p. 680] and Killarney roses (the latter slightly), but not plums, peaches, or pecans. The Celeste variety of fig was found to be more susceptible than larger, coarser types, such as Brunswick. The branches may contract infection through wounds or leaf scars. The excision of infected branches and painting the cut ends have so far failed to eliminate the fungus, and other control measures are under investigation.

Biraghi (A.). **Variazioni in due ceppi di 'Gloeosporium olivarum' Alm. di provenienze diverse.** [Variations in two strains of *Gloeosporium olivarum* Alm. from different localities.]—*Boll. R. Staz. Pat. Veg.*, N.S., xiv, 2, pp. 223–253, 18 figs., 1934. [English summary.]

A white strain of *Gloeosporium olivarum* [*R.A.M.*, xi, p. 226] isolated from olives sent from Greece gave rise in culture to a dark variant and this in turn gave four other variants, all of which remained constant. Another strain, from olives received from Portugal, had a dark grey mycelium like that of the first variant of the Greek strain and also gave rise to a variant. The original Greek strain, unlike its variants and the Portugese strain, did not form chlamydospores [see next abstract], while in repeated transfers it lost in great measure its ability to form hyphae and consisted largely of small conidia germinating by budding so as almost to resemble a yeast. Perithecia were not obtained from any of the forms.

As two strains not exactly agreeing with the description of the type species of *G. olivarum* were obtained from climatically different regions such as Greece and Portugal, and as their distinctive characters were to some extent bridged by the variants, the author tentatively suggests that in nature forms may exist specific for certain limited nutritional and environmental conditions [ibid., xi, p. 226].

A bibliography of 37 titles is appended.

Biraghi (A.). **Sul significato biologico dei presunti 'appressori' nel gen. Gloeosporium.** [On the biological significance of the presumed 'appressoria' in the genus *Gloeosporium*.]—*Boll. R. Staz. Pat. Veg.*, N.S., xiv, 2, pp. 202–210, 3 figs., 1934. [English summary.]

After discussing the views held by different workers as to the chlamydosporal or appressorial nature of the brown organs develop-

ing at the apex of the germ-tube in *Gloeosporium* and *Colletotrichum* the author describes experiments in which, when the conidia of *G. olivarum* [see preceding abstract] were germinated in hanging drop cultures, these organs developed either at the margins of the drops, where, owing to evaporation, the germ-tubes were left dry, or at the base of the drop, in contact with the glass; in the latter case, their production increased with age. When the conidia were germinated in different liquids, the brown organs were most numerous in those poor in nutritive materials, especially distilled water. In weak solutions of copper sulphate their production was very precocious and intense. They were also noted on hyphae in old cultures. From these observations the author concludes that the organs in question are not appressoria but organs of conservation produced under unfavourable environmental conditions, and therefore analogous to chlamydospores.

Davies (C.). **A method to determine the surface area of trees covered by spray fluid and to obtain a permanent record of the degree of fineness of the deposit.**—*Journ. South-Eastern Agric. Coll., Wye, Kent*, xxxiv, p. 252, 1 pl., 1934.

To determine what surface area of sprayed trees has been covered by the spray fluid and obtain a permanent record of the degree of fineness of the deposit, transparent celluloid disks 2 in. in diameter are clipped to the trees before spraying is effected, the density of the dried deposit being increased if necessary by subsequently treating the disks with a suitable chemical (such as silver nitrate) which leaves no visible precipitate, but combines with the chemicals left by the spray. The disks, whether chemically treated or not, have a visible covering of spray and are used as negatives from which photographic prints are made, the percentage of cover obtained being determined by the eye. The disks can then be washed and used again. It was determined by examination that the surface tension between the spray fluid and the leaves of the variety of tree used was similar to that between the former and untreated celluloid disks, but occasionally it may be necessary to ascertain experimentally whether the disks collect the spray in the same way as the leaves, and if not, a transparent coating such as oil must be applied until they are similar.

Martin (H.) & Salmon (E. S.). **The fungicidal properties of certain spray-fluids. XI. Synthetic solvents.**—*Journ. Agric. Sci.*, xxiv, 3, pp. 469–490, 1934.

In the eleventh paper of this series [*R.A.M.*, xii, p. 576] the authors give a full account of their investigations of the fungicidal action on the conidial stage of *Sphaerotheca humuli* of manufactured hydrocarbons and their simpler hydroxyl-derivatives and esters. The sprays were prepared by agitation with 0·25 per cent. agral I.

Benzene, cyclohexane, methyl cyclohexane, dekalin, cymene, carvene, phellandrene, dipentine, turpentine, pine oil, geraniol, eucalyptus oil, and fenchone were phytocidal (i.e. injurious to the leaf in areas not invaded by the fungus) at the lowest concentrations at which they were fungicidal. α- and β- naphthol were

fungicidal at concentrations of 0·15 and 0·2 per cent., respectively, and, except in one experiment, were not phytocidal at concentrations under 0·5 per cent. As similar results were obtained with commercial grades of α- and β- naphthol, these appear to merit further trial for the control of powdery mildews. The polyhedric phenols and the phenolic acids tested were fungicidal only at concentrations at which serious leaf injury was caused. Saligenin, salicylaldehyde, and vanillin were inactive at concentrations of about 1 per cent., while paranitrophenol and picric acid were strongly phytocidal. Salicylanilide, applied in the form of its sodium salt (shirlan WS), was fungicidal at a concentration of 0·5 per cent., almost fungicidal at one of 0·25 per cent., and not injurious to the leaf at one of 1 per cent. Suspensions containing 1 per cent. salicylanilide were not fungicidal, but were more active when soap was used as the spreader. Solubility factors may influence the fungicidal behaviour of salicylanilide. None of the esters tested proved likely to be of practical value as a fungicide.

Oserkowsky (J.). **Fungicidal effect on Sclerotium rolfsii of some compounds in aqueous solution and in the gaseous state.**—*Phytopath.*, xxiv, 7, pp. 815–819, 1 diag., 1934.

The growth of the mycelium of *Sclerotium rolfsii* was inhibited by two to four days' exposure to saturated vapours at 29° to 30° C. of naphthalene, similar but stronger effects (resulting in the death of some of the cultures) being exerted by those of α-monochlornaphthalene and α-monobromnaphthalene. The mycelium was killed by the saturated vapours of trioxy-methylene, benzene, toluene, xylene, nitrobenzene, and ortho-, meta-, and paradichlorobenzene. The sclerotia of the fungus were destroyed by three days' exposure at 25° to 26° to the saturated vapours of benzene, toluene, xylene, ethylbenzene, n-propylbenzene, chlorobenzene, ortho- and metadichlorobenzene, 1-, 2-, 4-trichlorobenzene, nitrobenzene, chloroform, carbon tetrachloride, bromopicrin, iodine, carbon disulphide, and trioxymethylene. They were also killed by one day's immersion in 1 : 33 dilution of merthiolate or 0·1 per cent. solution of hexylresorcinol [cf. *R.A.M.*, xii, p. 509], and by five days in 0·1 per cent. o-chlorophenol. The substitution of an NO_2 radical in the benzene ring resulted in greater toxicity than that of either NH_2, Br, or 2 Cl atoms in the para position. The replacement of Cl by Br in chloropicrin [ibid., xiii, p. 98] enhanced the toxicity.

Munro (F. L.) & Newton (W.). **The inhibition of the growth of fungi by chemicals.**—*Scient. Agric.*, xiv, 10, pp. 560–564, 1934. [French summary.]

The authors carried out tests to determine the lowest concentrations at which a number of inorganic and organic chemicals [a list of which is given] inhibit the growth in pure culture of certain seed-borne fungi, namely, *Fusarium culmorum*, *Pythium ultimum*, and *Rhizoctonia* [*Corticium*] *solani*, supplemented by a study of the lowest concentrations (*dosis toxica*) [*R.A.M.*, ii, p. 555] at which these substances were toxic to wheat seedlings grown in Hoagland's nutrient solution. The object was to find solutions

that would be absorbed by seed in sufficient quantities to immunize it from fungal attack during the seedling stage of growth.

The results [which are tabulated] showed that with the exception of copper sulphate and copper nitrate, both at a concentration of 0·001 molar, all the chemicals tested more or less retarded the growth of the wheat seedlings, but no serious injury at concentrations higher than those required to inhibit fungal growth was caused by Cheshunt compound, copper acetate, potassium dichromate or cyanide, cresol, phenol, malachite green, chino[quino]sol [ibid., xi, p. 651], and mercurous sulphate. The ratio between '*dosis tolerata*' and '*dosis toxica*' was 10 in the case of phenol, cresol, quinosol, and malachite, while in the case of copper sulphate, acetate, or nitrate, Cheshunt compound, potassium cyanide or dichromate, lead chloride, and mercurous sulphate the ratio was 1. All the other chemicals, including zinc sulphate, mercuric chloride or cyanide, and silver nitrate, gave ratios below one, indicating that the concentration required to inhibit fungal growth is higher than the maximum concentration tolerated by the host.

Conference on co-ordination of agricultural research and plant protection. Held at Amani Research Station, 12th to 15th February, 1934.—Government Printer, Nairobi, iii + 56 pp., 1934.

The two chief purposes of this conference, held at Amani in February 1934 were to consider and co-ordinate the research programmes on coffee and on the pests and diseases of common crops in the British East African Territories, and to discuss the possibility of co-ordinating plant protection regulations in the Territories. Certain lines of work were designated as major projects (listed in a separate appendix), to be regarded as the special province of particular individuals or departments with special facilities for the work.

Careful consideration was given to the terms of a Plant Protection Ordinance to cover both the importation of plants from abroad and the regulation of their movement inside and between the territories, and it was decided to recommend uniform legislation on the lines of a draft Ordinance printed as Appendix VI to the report. The adoption is further recommended of a schedule of plant imports, classified under various degrees of restriction (Appendix VII on p. 45), based on a list, supplied by the Imperial Mycological Institute, of the principal diseases affecting these plants in external countries. It was recommended that the inter-territorial movement of plants should be subjected to the same regulations in regard to obtaining permits to import as those governing foreign imports.

Renn (C. E.). **Wasting disease of Zostera in American waters.**—*Nature*, cxxxiv, 3385, p. 416, 1 fig., 1934.

All the dark-coloured, spotted, diseased rhizomes and leaves of *Zostera marina* examined during 1933 along the coast of Massachusetts and New Jersey yielded thin-walled, tenuous, fusiform organisms, with terminal, often branching, delicate pseudopods, believed to be nearly related to the mycetozoan described under

the name of *Labyrinthula* by Cienkowski (*Arch. Microscop. Anat.*, iii, p. 274, 1867) as parasitic on marine algae. Neither bacteria nor the *Ophiobolus*-like fungi reported by other workers [*R.A.M.*, xiii, p. 716] could be detected. The air spaces of infected leaves were filled with net-like aggregates of the fusiform bodies, the members of which were connected by their filamentous pseudopods. In the zones surrounding the discoloured areas the organisms may occur in more loosely arranged chains. Within the cell the chloroplasts are disorganized and the nucleus disintegrated, the cell wall being free from injury except at the point of entrance of the pseudopod. Inoculation experiments with the *Labyrinthula*-like organism are in progress.

WIEDEMANN (H.). **Die Seegraskrankheit bedroht die deutsche Ostseeküste.** [The Sea Grass disease threatens the German Baltic coast.]—*Der Fischerbote* (*Norddeutsche Fischerei Zeit.*), xxvi, 7, pp. 228–229, 1934.

The sea grass [*Zostera marina*] disease [see preceding abstract] is stated to be nearing German waters if indeed it is not already present there. According to Danish reports [*R.A.M.*, xiii, p. 317] it extended in the autumn of 1933 to the island of Aarö in the Little Belt, to Nyborg in the Great Belt, and as far as the Nivaa Bay between Elsinore and Copenhagen in the Sound, whence it is travelling southwards. The inland waters bordering on the Baltic appear to be chiefly affected and the local eel, crab, and cod fisheries are suffering heavy damage.

FREISLEBEN (R.). **Zur Frage der Mykotrophie in der Gattung Vaccinium L.** [On the question of mycotrophy in the genus *Vaccinium* L.]—*Jahrb. Wissensch. Bot.*, lxxx, 3, pp. 421–456, 8 figs., 1934.

Mycorrhizal fungi similar to that isolated by the author from the roots of *Vaccinium myrtillus* [*R.A.M.*, xiii, p. 255] were also isolated from *V. vitis-idaea* and *V. uliginosum* and their identity with the fungi present in the mycorrhiza established by the synthetic formation of mycorrhiza in each of the hosts. As the cultures remained sterile, the fungi are designated *Mycelium radicis myrtilli* (of which two strains α and β were differentiated), *M. r. vitis-idaeae*, and *M. r. uliginosi*, respectively. They differed markedly from one another in cultural characters but less so in morphology, and bore no resemblance to *Phoma radicis callunae* Rayner, with which they were compared, nor did they appear to be in any way related to the genus *Phoma*.

Cross-inoculation experiments showed that the strains were not specific to their hosts; each was able to synthesize the mycorrhiza of all three of the above-mentioned species and also of *V. oxycoccus*. The epidermal cells were penetrated and filled with dense coils of hyphae. In some areas every cell of the epidermis was penetrated, in others only a larger or smaller proportion of them. The strains were not all equally virulent, *M. r. uliginosi*, for instance, causing only a relatively mild infection of *V. myrtillus*. In all cases the addition of the fungus stimulated the development of the seedlings.

Tests with other fungi showed, however, that this stimulatory

action was not the result of mycorrhiza formation. Even with common moulds such as *Penicillium glaucum*, in which no penetration of the roots occurred, the addition of cultures to 'pure culture' seedlings of the hosts exerted a stimulatory action of the same order as that caused by the endophytes. Tests with cultures of *Phoma r. callunae* gave the same result, but no penetration of the root or formation of mycorrhiza was observed.

The endophytes are, therefore, not specifically of value to the normal development of the plants tested. Whether the stimulatory action of the fungi is due to neutralization of some inhibitory substances (produced perhaps by the sterilization of the medium in which the seedlings are grown) by the metabolic products of the organisms, or the latter exert some direct stimulatory action on the seedlings, has not been determined.

The bearing of these results on those obtained by M. C. Rayner is discussed and the conclusion reached that an obligate symbiosis between fungus and host has not been established in the genus *Vaccinium*.

FRANCKE (H. L.). **Beiträge zur Kenntnis der Mykorrhiza von Monotropa hypopitys L. Analyse und Synthese der Symbiose.** [Contributions to the knowledge of the mycorrhiza of *Monotropa hypopitys* L. Analysis and synthesis of the symbiosis.]—*Flora*, N.F., xxix, 1, pp. 1–52, 15 figs., 2 graphs, 1934.

None of the procaulomes of *Monotropa hypopitys* (a holosaprophytic Pyrolaceae) [cf. *R.A.M.*, xiii, p. 718] examined by the writer in the vicinity of Würzburg, Germany, showed complete freedom from fungal infection, the intensity of which increased parallel with an augmentation in the humus content of the soil. Where the latter is low and infection correspondingly slight the ill-nourished procaulome is widely extended, with long lateral branches, and thus resembles the root system of autotrophic plants. *M. hypopitys* is evidently dependent on the fungal symbiont for its nutriment and affords an illustration of obligatory mycotrophy. The septate hyphae of the fungus form a pseudoparenchymatous mantle, especially dense on the younger, actively growing parts of the procaulome, and penetrating between the epidermal cells. The latter are entered, each by a single haustorium which swells into a bladder at the tip, the contents of which are finally liberated into the cell.

The fungus was isolated from plants growing in various types of soil and from both host varieties (*hirsuta* and *glabra*). On 3 per cent. malt agar a luxuriant white (later brownish) mycelium develops rather slowly. Scalariform anastomoses and hyphal fusions are frequent. The hyphae average 3 to 5 μ in thickness and are regularly septate at intervals of about 50 μ; with particularly favourable nutriment they may reach a diameter of up to 9 μ and produce intercalary, vesicular swellings up to 20 μ in diameter. Neither clamp-connexions nor conidia were observed, but as the cells of the mantle and of cultures from it are regularly binucleate, the fungus is considered to be the diploid stage of a Basidiomycete. A yellowish-brown pigment is diffused through the medium in the

presence of sufficient nutriment, and a pungent odour, recalling that of *Boletus* fructifications, is emitted by the mycelium. The minimum, optimum, and maximum hydrogen-ion concentrations for growth were determined as P_H 8·5, 5, and 2 to 2·5, respectively. Dextrose, maltose, dextrin, mannite, and humic acid were found to be good sources of carbon, while nitrogen was supplied by peptone, albumin, ammonium sulphate, urea, calcium nitrate, asparagin, and nucleic acid. Molecular atmospheric nitrogen was not fixed, even after the addition of readily assimilable nitrogen compounds. Better growth was made on softwood humus than on that from a beech wood. In the absence of fructifications the systematic position of the fungus could not be definitely ascertained, but a relationship with *Boletus* appears to be indicated.

The seeds of *M. hypopitys* were shown by experiments under controlled conditions to be capable of germinating independently of fungal aid, but the latter appears to be essential—at any rate in nature—to the further development of the seedling. Mycorrhizal synthesis was successfully accomplished, seedlings placed in pure cultures of the specific fungus making vigorous growth and forming a mantle. Negative results followed the use of various other Hymenomycetes.

Chabrolin (C.). **La germination des graines de Thesium humile exige l'intervention de champignons saprophytes.** [The germination of *Thesium humile* seeds requires the intervention of saprophytic fungi.]—*Comptes rendus Acad. des Sciences*, cxcix, 3, pp. 225–226, 1934.

In nature the achenes of the annual Santalaceae, *Thesium humile*, a cereal parasite in Tunis, germinate without a host, but their cell walls were consistently found to be permeated by saprophytic fungi, such as *Alternaria tenuis*, *Macrosporium commune* [? *Pleospora herbarum*: *R.A.M.*, xi, p. 449], and *Cladosporium herbarum*, the presence of which was experimentally shown to be indispensable to the proper growth of the plant. The latter absolutely failed to germinate in an aseptic medium and developed only to a limited extent and after considerable delay in sterilized sand. In an aseptic medium the seeds germinate if the outer sclerenchymal layer is cut, and it is suggested that the function of the saprophytes in nature may be to soften the hard tissues, which then rupture and enable the internal tissues to absorb the necessary moisture.

Carbone (D.) & Arata (Mlle M.). **Sur le mécanisme de l'immunité acquise chez les plantes.** [On the mechanism of acquired immunity in plants.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, vi, 6, pp. 219–226, 1934.

Investigations [which are described] on certain histocytological aspects of plant immunity showed that the defensive reactions of beans [*Phaseolus vulgaris*] when inoculated through wounds with the 'toile' disease organism [*Botrytis cinerea*: *R.A.M.*, x, p. 612; xi, p. 779] consisted partly of the ordinary traumatic reactions but were also partly definite reactions against the pathogenic agent. The defensive reactions of vaccinated plants differed from those

of the controls only in the much greater intensity and rapidity of the former. The presence of the fungus appears to induce in the cells, even at some slight distance away, the formation of substances which inhibit fungal growth.

Berry (J. A.) & Magoon (C. A.). **Growth of microorganisms at and below 0° C.**—*Phytopath.*, xxiv, 7, pp. 780–796, 1 graph, 1934.

After a detailed review of the literature since 1887 regarding the growth of micro-organisms on foodstuffs preserved at low temperatures, the writers describe experiments which showed that a species each of *Cladosporium* and *Sporotrichum* from okra [*Hibiscus esculentus*] and peas, respectively, were the fungi that grew best at temperatures below −5° C. Spore germination of certain moulds has been observed at −7·78° and there were indications that mycelial growth can occur even below this. Microbial growth below −10° appears to be unlikely.

Shimada (S.). **Conidia formation in Trichoderma narcissi Tochinai et Shimada.**—*Trans. Sapporo Nat. Hist. Soc.*, xiii, 3, pp. 223–224, 1 fig., 1934.

In cultures of *Trichoderma narcissi*, a parasite of *Narcissus* bulbs in Japan [*R.A.M.*, xi, p. 304], exposed in the laboratory to diurnal alternations of diffused light and darkness, dark green conidia were formed abundantly under the influence of light but no conidia developed in the dark, so that well-marked white and green zonation resulted [cf. ibid., iv, p. 628].

Wang (Mlle D. T.). **Contribution à l'étude des Ustilaginées (cytologie du parasite et pathologie de la cellule hôte).** [A contribution to the study of the Ustilagineae (cytology of the parasite and pathology of the host cell).]—*Le Botaniste*, Sér. xxvi, 4–5, pp. 540–670, 11 pl., 14 figs., 1934.

A detailed, fully documented account, supplemented by a bibliography of 126 titles, is given of the writer's cytological studies on some important smuts belonging to the Ustilaginaceae [cf. *R.A.M.*, xii, p. 210] and Tilletiaceae, considered under the following general aspects: structure and germination of the chlamydospores, cellular anastomoses and mycelial development, parasitic mycelium, fructification, sexuality, vacuome and cytome, and pathological modifications of the host cell.

Scharrer (K.) & Schropp (W.). **Beiträge zur Frage der Wirkung des Bors auf das Pflanzenwachstum.** [Contributions to the question of the effect of boron on plant growth.]—*Landw. Jahrb.*, lxxix, 6, pp. 977–999, 7 figs., 1934.

A detailed, tabulated account is given of the writers' experiments at Weihenstephan, Munich, on the effects of boron on plant growth. On all types of soil (miocene sand, quaternary clay, and loess) where heart and dry rot of beets was prevalent, either naturally or in consequence of liming, the application of boric acid at the rate of 1 to 2 mg. per pot controlled the disease [see above, p. 743]. This result was found to be entirely unconnected with any re-

adjustment of the hydrogen-ion concentration of the soil, being apparently due in the first instance to some specific physiological or colloid-chemical property of the borate ion.

The yield of potatoes on limed and unlimed miocene sand was appreciably augmented by boron, which also exercised a moderately stimulatory effect on maize on clay soil.

KNOBLAUCH (H. C.) & ODLAND (T. E.). **A magnesium deficiency induced by previous fertilizer treatments.**—*Journ. Amer. Soc. Agron.*, xxvi, 7, pp. 609–615, 1934.

This is an extended account of the writers' investigations on the occurrence and control of potato chlorosis, associated with a high potash and low magnesium content of the soil in Rhode Island, a note on which has already appeared [*R.A.M.*, xiii, p. 537].

BÖHME (R. W.). **Das Vorkommen von Virosen auf dem Dahlemer Versuchsfelde.** [The occurrence of viruses on the Dahlem experimental field.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xxi, 1, pp. 1–58, 20 figs., 1934.

A comprehensive, tabulated account is given of the writer's further investigations on the nature of the virus diseases of potatoes occurring on the Dahlem (Berlin) experimental field [*R.A.M.*, xiii, pp. 319, 720]. The basis of the present studies was afforded by Köhler's observations on the rapid and progressive deterioration of the Gustav Adolf variety in this field since 1930 [ibid., xiii, p. 462]. Two types of degeneration may be distinguished, one (type A) characterized by streak necroses, mosaic, and curling of the pale green pinnate leaves, and the other (type B) by rugosity of the dull greyish-green lamina and a sharply acute angle of leaf insertion. Of these, the former may unequivocally be classified as streak [ibid., xiii, p. 464 *et passim*], whereas in the etiology of the latter, soil and atmospheric factors appear to play at least an equally important part with the leaf roll and X viruses subsequently obtained from affected plants.

Only one of the six G.A. [Gustav Adolf] plants showing no pathological symptoms was shown by stem grafting experiments (found in the author's experiments to be the most certain method of transmitting infection) on the same variety, *Datura stramonium*, and tomato to contain the 'healthy potato' (X) virus [ibid., xiii, p. 463 *et passim*]. Of 25 G.A. type A plants used in similar tests on Preussen, Wohltmann, Deodara, and Ackersegen potato varieties, *Petunia violacea* and *P. nyctaginiflora*, cultivated and wild (*Solanum racemigerum*) tomato, *D. stramonium*, *S. miniatum*, and *Hyoscyamus niger*, 16 were adjudged by the symptoms thus induced to contain the Y virus and 8 X + Y. The symptoms produced by the latter combination were more severe than when Y alone was present. Further tests with G.A. progeny showing symptoms resembling, but not identical with, type A were carried out (*a*) by rubbing with infective juice and (*b*) by aphid (*Myzus persicae*) transmission on eight standard potato varieties and White Burley tobacco. The results of these experiments pointed to the exclusive transmission of the Y virus, except in certain cases where leaf roll also was present and was transmitted. In

every case the presence of Y alone caused the most typical symptoms of the A kind, mixed infections causing various differences in the expression of the symptoms. Streak is a first-year symptom and is followed in subsequent years by the type A symptom complex. In Erstling [Duke of York] the Y virus induced a coarse, curling form of mosaic.

In the B type of disease in Gustav Adolf the presence of leaf roll and the X virus was demonstrated by similar methods. The X virus was transmitted by stem grafting to a number of test plants, the symptoms on several of which are described. In all cases where acronecrosis followed, only the X virus was determined to be present. Acronecrosis was also produced in Paul Krüger [President] potatoes by tuber grafting from Duke of York containing X. Further studies showed that in the case of the B type of symptoms, the stunting and rugosity of the foliage were conditioned by environmental factors, while the vertical habit of leaf growth may be interpreted as a second-year symptom of the leaf roll virus.

Symptomless G.A. plants reacted to grafting with G.A. and Kuckuck potato scions, containing the X virus in a latent and aberrant form, respectively, by the transient production of inconspicuous mottling on the youngest leaves. Reciprocal grafts of symptomless G.A. on Kuckuck and Duke of York gave negative results. From the transitional differences in symptom expression on *D. stramonium*, tomato, and tobacco it is concluded that the infective principles of these origins represent permanent modifications of the virus of relative stability, to which the names X_1 of Duke of York, X_3 of Kuckuck, and X_2 of Gustav Adolf are given. Under adverse conditions of growth the expression of acronecrosis may be modified to such an extent as to resemble Quanjer's acropetal necrosis [ibid., x, p. 746] or streak induced by the Y virus. In the chronic form of the disease the anatomical detection of necroses in the inner phloem seems to afford a more reliable diagnostic character than the external symptoms.

Only in one out of 31 greenhouse inoculation tests (by rubbing) could a virus be detected differing both from X and Y; its effects were visible on chilli (*Capsicum annuum*) fruits (but not on the leaves) in the shape of concentric rings, and it was taken to be a late infection by a weak strain of cucumber mosaic [ibid., xiii, p. 331]. The latter was further observed in five out of ten tobacco plants on an experimental plot near market-gardens infested by aphids and a thoroughly degenerated potato stand, while two other tobacco plants showed symptoms suggestive of 'coarse etch' [ibid., x, p. 60]. Two Ackersegen potato plants presented an appearance indicating the simultaneous presence of the ring spot and Y viruses. Previous observations on the same plot had revealed the occurrence of true tobacco mosaic.

TAUBENHAUS (J. J.). **Studies on Potato-scab control.**—Abs. in *Phytopath.*, xxiv, 7, p. 836, 1934.

Complete control of potato scab (*Actinomyces scabies*) was obtained in 1933 in east and east-central Texas by the application of sulphur in the furrows two to three weeks before planting at

rates varying from 500 to 1,500 lb. per acre in the neutral and calcareous soils, respectively [cf. *R.A.M.*, xiii, p. 536].

LEPIK (E.). **Kartulivähi geograafilisest levimisest.** [Geographical distribution of the Potato wart disease.]—*Mitt. Phytopath. Versuchsstat. Univ. Tartu* [Dorpat] 22 (Reprinted from *Agronomia*, xv, 7, pp. 270–273, 1934), 7 pp., 2 figs., 1 map, 1934. [German summary.]

In giving a list of the European countries, in which the author states that the potato wart disease (*Synchytrium endobioticum*) has been so far officially recorded, namely, Norway, Sweden, Russia, Poland, Germany, Denmark, France, Great Britain, Switzerland, Belgium, Holland, Austria, Hungary, Czecho-Slovakia, Rumania, and Malta [this is incorrect: wart disease has not been found in the Maltese Islands], he reports that the disease is not yet known to occur in Esthonia, where its importation is prevented by strict phytosanitary and quarantine measures. From England the potato wart disease is stated to have been introduced into the United States, Canada, Newfoundland, Peru, Japan, and South Africa.

POOLE (R. F.). **Sweet Potato ring rot caused by Pythium ultimum.**—*Phytopath.*, xxiv, 7, pp. 807–814, 3 figs., 1934.

Field and laboratory studies in New Jersey showed that *Pythium ultimum* is the agent of ring rot as well as of mottle necrosis of sweet potatoes [*R.A.M.*, vi, pp. 506, 748; xi, p. 331]. Infection occurs in the field through the stem ends and feed roots, but the heaviest losses are sustained during storage. The fungus was readily isolated from decaying sweet potatoes and grew well on a number of standard media. Pronounced rotting ensued 36 to 48 hours after the insertion of an active culture into the cortex, the tissues ultimately collapsing to form a depressed ring around the tuber. In a saturated atmosphere at 20° C., six well-developed rings were formed by six inoculations on a single sweet potato. The rot is of a greyish colour and moderately soft in consistency. Nancy Hall sweet potatoes harvested on 30th November, 1930, showed 100 per cent. infection by *P. ultimum* compared with 0, 3, and 8 per cent. for 15th, 20th, and 30th October, respectively, indicating the importance of lifting before the heavy rains. Positive results were given by inoculations with *P. ultimum* on bean [*Phaseolus vulgaris*: ibid., vi, p. 749; vii, p. 2], beet, potato [ibid., xiii, p. 563], turnip, and radish. *Rhizopus nigricans* failed to produce the typical ring rot symptoms in inoculation experiments.

GIGANTE (R.). **La maculatura grigia interna dei tuberi di Patata.** [Internal grey spot of Potato tubers.]—*Boll. R. Staz. Pat. Veg.*, N.S., xiv, 2, pp. 256–267, 8 figs., 1934. [English summary.]

An account is given of a condition affecting potato tubers in Italy and characterized by the presence in the parenchymatous and vascular tissues of light grey, scattered spots which darkened, became dry and spongy, and frequently cracked so as to form small cavities. In slight cases the spots were composed of necrosed, irregularly shaped cells containing normal starch, while in more

advanced forms the necrotic area was surrounded by a cork layer. The only external symptom (not invariably present) was bruising. When the vascular ring was affected the eyes in the part concerned died.

Three large-scale experiments demonstrated that the condition (which was not associated with any parasitic organism, and which the author does not regard as belonging to the virus group of diseases) was not hereditary, only 2 per cent., all of which showed marked bruising and spade injury, out of 1,000 tubers grown from affected seed pieces developing the condition.

That the condition was due to mechanical injuries, as was indicated by the nature of the lesions, was conclusively demonstrated by tests in which 50 per cent. (or practically the same proportion as that originally affected) of the current and previous years' healthy tubers after being kept under weights of 2 to 5 kg., subjected to hydraulic pressure, or hit with a hammer, and then stored for a fortnight in a well-aerated atmosphere, developed typical grey spot.

The paper concludes with brief recommendations for control by more careful handling of the tubers during storage and transport.

FUKUSHI (T.). **Plants susceptible to dwarf disease of Rice plant.** —*Trans. Sapporo Nat. Hist. Soc.*, xiii, 3, pp. 162–166, 1934.

It was shown by controlled experiments [the results of which are tabulated and briefly discussed] that the virus of rice dwarf is transmissible by the leafhopper *Nephotettix apicalis* var. *cincticeps* [*R.A.M.*, xiii, p. 261] from diseased rice plants to *Panicum miliaceum*, *Echinochloa* [*P.*] *crus-galli*, *Alopecurus fulvus* L. [(?) *A. geniculatus* L.], and *Poa pratensis*. The symptoms on these plants are similar to those on rice, consisting in streaking and spotting of the foliage and general stunting. Rye, wheat, and oats are only slightly susceptible to rice dwarf and attempts at transmission to barley, maize, sorghum, and *Setaria italica* failed. The occurrence of the disease on *A. fulvus* is worthy of note, since this biennial wild grass is abundant in the rice fields and may possibly serve to carry the virus over the winter.

SAKAMOTO (M.). **Catenulate conidia formation in Ophiobolus miyabeanus Ito et Kuribayashi.**—*Trans. Sapporo Nat. Hist. Soc.*, xiii, 3, pp. 237–240, 1 pl., 1 fig., 1934.

Ophiobolus miyabeanus, the perfect stage of the rice leaf spot fungus, *Helminthosporium oryzae* [*R.A.M.*, xiii, p. 256], in rice culm decoction agar cultures was observed to form catenulate, generally uni-, rarely pluriseptate, oval to elliptical, oblong, or cylindrical, sub-hyaline conidia, 4 to 20 by 4 to 7 μ, rarely up to 40 μ in length, which germinated readily in tap water with a germ-tube 5·6 to 7 μ in width. The chains were often branched, two or three rows of microconidia arising from one of those first produced. This type of conidial formation, which is somewhat reminiscent of that in *Alternaria*, appears to be a peculiarity of certain strains of *O. miyabeanus* occurring independently of environmental conditions. The chains may either be proliferated from

the terminal cell of an ordinary conidium or produced directly on a conidiophore.

Tochinai (Y.) & Ishizuka (K.). **The after effect of the fungus filtrate of Gibberella fujikuroi on Rice plants.**—*Trans. Sapporo Nat. Hist. Soc.*, xiii, 3, pp. 148–152, 1 fig., 1934.

It was shown by experiments [the results of which are tabulated and briefly discussed] that the effects on rice seedlings of the filtrate from cultures of the 'bakanae' fungus (*Gibberella fujikuroi*) [*R.A.M.*, xiii, p. 652] are limited to the actual period of contact between the plants and the growth-promoting toxin. On transference of the treated seedlings from the sand cultures watered with the filtrate to a healthy culture bed containing farm soil, the abnormally elongated seedlings completely recovered from the disorder induced by the fungal toxin and yielded equally well with the controls.

Iwadare (S.). **Studies on Epicoccum oryzae Ito et Iwadare, n.sp.**—*Trans. Sapporo Nat. Hist. Soc.*, xiii, 3, pp. 210–217, 2 figs., 1934.

The salient features of the writer's studies on *Epicoccum oryzae*, one of the agents of 'red blotch' of rice in Japan, have already been noticed from another source [*R.A.M.*, xiii, p. 538].

Murray (R. K. S.). **Oidium leaf disease in Ceylon in 1934.**—*Second Quart. Circ. for 1934, Rubber Res. Scheme (Ceylon)*, xi, 2, pp. 36–42, 1934.

In 1934 *Oidium* leaf disease [*O. heveae*: *R.A.M.*, xiii, p. 593] broke out with increased severity in most of the *Hevea* rubber-growing areas of Ceylon. Since the disease, once it becomes severe on any estate, tends to cause increasing damage in successive years, the present situation is not expected to improve unless control measures are widely adopted; otherwise, the disease will become increasingly severe at mid-country elevations, and may also do so in the low-lying districts, where in one area it was observed to be active as late as June and is perhaps becoming acclimatized. Under ordinary conditions sulphur dusting can be carried out on an estate scale in Ceylon at an average cost of 5 rupees [7/6] per acre per annum, excluding the price of the machine, which is about 1,200 rupees [£90] for the types used.

Murray (R. K. S.). **The sulphur dusting treatment for Oidium.**—*Second Quart. Circ. for 1934, Rubber Res. Scheme (Ceylon)*, xi, 2, pp. 43–53, 6 pl., 1934.

A brief, practical account, designed for the assistance of planters, is given of the sulphur dusting treatment of *Hevea* rubber against *Oidium* leaf disease [*O. heveae*: see preceding abstract] in Ceylon, the points dealt with including the circumstances when treatment is advisable, the equipment required, field technique, the time and number of applications, quantity of sulphur, field supervision, the provision of roads through the estate (strategically placed in relation to the prevailing breezes) along which the machine can be taken on a cart or lorry (at present it is ordinarily carried by hand

slung on poles), costs, danger of sulphur-tainting to tea in proximity to the rubber, and the limitations of the method. Dusting should be carried out at intervals not exceeding 10 days and is best done while moving the machine at right angles to the direction of the wind, in short bursts of five minutes or so. About 100 acres a day can be done with one machine; the quantity of sulphur required for each application varies considerably but with a seven-day interval 10 lb. per acre may be regarded as a maximum dose for severe infections. The paper concludes with a short summary for rapid reference.

Salmon (E. S.) & Ware (W. M.). **The downy mildew of the Hop in 1933.**—*Journ. South-Eastern Agric. Coll., Wye, Kent*, xxxiv, pp. 107–113, 1934.

In this account of the hop downy mildew [*Pseudoperonospora humuli*: *R.A.M.*, xiii, p. 125] situation in England in 1933 the authors state that the first basal spike (in a non-sporing condition) was found in Kent on 27th March, and the first to bear spores on 3rd April; two days later, 291 were collected in a garden of six acres. By 10th May, terminal spikes were appearing in several gardens, the first fortnight of the month being showery and favouring spore production.

In August the disease was still active, but owing to hot, dry weather at the end of the month and in September, no spread occurred from any isolated source of infection, and the crop was the healthiest of recent years.

On one farm where very numerous basal spikes had been present early in the season, but where 'spiking' had been effected by two women twice a week from the start, no terminal or lateral spikes were found on 12th June and none of the leaves showed any sporing angular spots.

Some three-quarters of the total Kentish hop acreage received three applications of Bordeaux mixture, immediately before or after the appearance of the burr and again after its disappearance.

Evidence was obtained that applications to the hills of copper-lime dust [ibid., xii, p. 325] offers no prospect of appreciably reducing the number of basal spikes.

Scott (C. E.). **Downy mildew of Hops (Pseudoperonospora humuli) in California.**—*Plant Disease Reporter*, xviii, 7, p. 96, 1934. [Mimeographed.]

Downy mildew of hops (*Pseudoperonospora humuli*) is stated to be present in Sonoma and Mendecino Counties, California [*R.A.M.*, xii, p. 656], occurring in a serious form in about a third of the hop yards in the former county.

Davis (R. L.). **Sugarcane variety P.O.J. 2878 in Puerto Rico.**—*Puerto Rico Agric. Exper. Stat. Bull.* 35, 45 pp., 7 figs., 1934.

Along the entire north coast of Porto Rico the mosaic-resistant P.O.J. 2878 sugar-cane variety is being extensively planted to replace the susceptible B.H. 10(12) with highly satisfactory results [*R.A.M.*, xiii, p. 539]. In a two-year (1929–31) varietal trial at Central Cambalache, primavera canes (i.e., those planted in the

spring and harvested at 12 to 14 months) of P.O.J. 2878 outyielded B.H. 10(12), and gave an approximately equal sugar content (11·46 per cent.) though this was below that of S.C. 12/4 (12·87 per cent.). In the first ratoons, however, the sugar content of P.O.J. 2878 exceeded that of the other varieties (9·44 per cent. compared with 8·76 and 8·4 per cent. for S.C. 12/4 and B.H. 10(12), respectively). In the 1929–30 first ratoon crop P.O.J. 2878 outyielded B.H. 10(12) by an average of over 17 tons of cane per acre, the corresponding figure for 1930–1 being 28·42 tons, the total excess of sugar for the two crops combined being 4·1 tons over S.C. 12/4 and 5·17 over B.H. 10(12). In a 13-month primavera test at Central San Vicente the yield of P.O.J. 2878 exceeded that of B.H. 10(12) by 5·8 tons of cane and 0·579 ton of sugar per acre, the sugar content of both varieties again being approximately equal (over 11 per cent.). Details are given of a number of general field trials, in most of which P.O.J. 2878 compared favourably with the other varieties used, though it was outyielded by B.H. 10(12) in gran-cultura (i.e., cane planted in the summer or autumn and harvested at 16 to 18 months) at Fajardo and the eastern end of the island, especially in lowlands subject to flooding.

On the silty clay flat lowlands of Central Colosa the P.O.J. 2714 variety suffered severely from dry top rot (*Plasmodiophora*) [*Amoebosporus vascularum*: ibid., xii, p. 467].

Wiles (D. R. D.). **Report of Plant Diseases Inspector.**—*Barbados Agric. Journ.*, iii, 2, pp. 39–44, 1934.

In this report on the work of the Barbados Department of Science and Agriculture for the year ending 31st March, 1934, notes are given by the Plant Diseases Inspector on the present position in the island as regards sugar-cane mosaic. The leaf symptoms of gumming disease [*Bacterium vascularum*: *R.A.M.*, xii, p. 788] were observed wherever the Ba. 11569 variety was cultivated, but no factory reported any difficulty in the manufacture of sugar from affected canes.

Report on the Agricultural Department, St. Kitts-Nevis, for the year ended 31st December, 1933.—Trinidad, Imper. Comm. of Agric., West Indies, 49 pp., 3 graphs, 1934.

On p. 38 of this report it is stated that gumming disease of sugar-cane [*Bacterium vascularum*] is on the increase in St. Kitts-Nevis, where 60 per cent. of the canes grown belong to susceptible varieties [*R.A.M.*, xii, p. 57], infection being observed in practically every field. On the other hand, no trace of mosaic was detected during the year.

Dey (P. K.). **The red rot of Sugarcane.**—*Dept. of Agric., U.P. Bull.* 66, 4 pp., 1 pl., 1933. [Received September, 1934.]

A semi-popular account is given of red rot of sugar-cane (*Colletotrichum falcatum*), which is stated to be causing considerable damage of late years in the United Provinces, India [cf. *R.A.M.*, viii, pp. 266, 549], with directions for its control by thorough field sanitation, supplemented in cases of heavy infestation by a four- to five-year crop rotation.

Takasugi (H.). **Additional list of the fungi of Manchukuo (first note).**—*Trans. Sapporo Nat. Hist. Soc.*, xiii, 3, pp. 185–190, 1934.

A list is given of 52 species of parasitic fungi collected from 1926–33 in Manchukuo (Manchuria), 42 of which were not recorded by Miura in his 'Flora of Manchuria and Mongolia, Part III', 1928 (*Indus. Mat.*, xxvii. S. Manchuria Ry. Co., 1928), while 10 are now reported on new hosts. Some of the Erysiphaceae included in the present list were previously investigated by Miss Homma [*R.A.M.*, x, p. 273].

The following are among the items of special interest. Rice was attacked by *Sclerospora oryzae* Brizi [usually referred to *S. macrospora* Sacc.: ibid., xi, p. 222; xii, p. 537], *Phyllosticta oryzaecola*, and *Gibberella fujikuroi* [see above, p. 801]. *Taphrina truncicola* Kusano was observed on *Prunus glandulosa* and *P. mongolica*. Sunflowers (*Helianthus annuus*) were infected by *Erysiphe cichoracearum* [ibid., xii, p. 571]. *Mycosphaerella maydis* occurred on maize [ibid., xii, p. 505]. Cotton was attacked by *Glomerella gossypii* [ibid., xii, p. 395] and *Phyllosticta gossypina* [ibid., xi, p. 638]. *Dioscorea batatas* Decne. was infected by *P. dioscoreae*. *P. phaseolorum* [ibid., xii, p. 330] occurred on *Phaseolus radiatus* var. *aurea*. Tobacco was attacked by *Alternaria tabacina* and *Macrosporium* [*A.*] *longipes* [ibid., xii, p. 748]. *Cercospora raciborskii* [*C. vignae-sinensis*: see next page] was observed on cowpeas. Maize was infected by *Helminthosporium maydis* [ibid., xiii, p. 366] and *Panicum miliaceum* by *H. panici-miliacei* and *H. yamadai* [ibid., viii, p. 530].

Togashi (K.) & Onuma (F.). **A list of parasitic fungi collected on Mt. Hayachine, Iwate Prefecture.**—*Bull. Imper. Coll. of Agric. & Forestry* (Morioka, Japan), xvii, 74 pp., 11 figs., 1934.

An annotated list is given of 184 species of parasitic fungi collected between 1928 and 1932 on Mt. Hayachine, Iwate Prefecture, Japan, of which eleven are regarded as new to science and provided with Latin diagnoses. Fungus and host indices are appended.

Cash (Edith K.). **Alaskan fungi.**—*Plant Disease Reporter*, xviii, 7, pp. 74–88, 1934. [Mimeographed.]

An annotated list is given of 159 fungi collected in Alaska by N. E. Stevens and J. P. Anderson in 1922 and 1923, respectively, some of which are believed to be new records for North America.

Matsumoto (T.). **Some remarks on the taxonomy of the fungus Hypochnus sasakii Shirai.**—*Trans. Sapporo Nat. Hist. Soc.*, xiii, 3, pp. 115–120, 2 figs., 1934.

A table is given showing the principal vegetative and growth differences between *Corticium sasakii* [*R.A.M.*, xiii, p. 725] and *C. solani*, the former isolated from rice in Japan and the latter from potato in Germany [ibid., xii, p. 331]. There are also certain differences between these two organisms in the perfect stage, the basidial sterigmata of *C. sasakii*, for instance, numbering 2 to 4 and measuring 5 to 8 by 2·2 to 2·7 μ, compared with 4 to 6

(measuring 6 to 16 μ) for *C. solani*. The dimensions of the basidia in *C. sasakii* are 10 to 16 by 8 to 9 μ and in *C. solani* 10 to 20 by 7·5 to 11 μ, the corresponding basidiospore measurements being 6 to 10 by 4 to 7 and 8 to 14 by 4 to 6 μ respectively. Considered alone these divergences in the perfect stage are insufficient to justify specific separation, but in conjunction with the vegetative differences they afford additional grounds for regarding *C. sasakii* as distinct from *C. solani*. Attention is drawn to some very close resemblances between *C. sasakii* and *C. koleroga* [ibid., vii, p. 249; xiii, p. 230], studies on the possible relationship of which are in progress. Pending their completion the name *C. sasakii* should be retained.

Brundza (K.). **Medžiaga Lietuvos Erysiphacejoms pažinti.** [Contribution to the knowledge of the Lithuanian Erysiphaceae.]—*Žemės Ūkio Akademijos Metraščio*, Kaunas [Kovno], *1933*, pp. 107–197. 2 pl., 10 figs., 11 diags., 1 graph, 1934. [German summary.]

This is stated to be the first attempt to bring together and systematize the information available in the literature on the Erysiphaceae of Lithuania. A few general considerations on the morphology and biology of the organisms, a description of the methods used by the author in his investigation, and a key to the genera and species of the Erysiphaceae are given. This is followed by a brief description of 54 species (*sensu* Blumer) [*R.A.M.*, xiii, p. 127], belonging to six genera, based mainly on the author's personal studies, together with a list of the 233 host plants on which they were found in Lithuania, and some ecological notes of local interest. Special attention was given to the study of conidial shapes and to the *Oidium* types in the species investigated, and an attempt is made to classify them as either *Pseudoidium* or *Euoidium* (*sensu* Jaczewski) [ibid., vii, p. 346].

Yamamoto (W.). **Cercospora from Formosa I.**—*Trans. Sapporo Nat. Hist. Soc.*, xiii, 3, pp. 139–144, 3 figs., 1934.

Taxonomic notes are given on nine species (five new) of *Cercospora* collected in Formosa in 1933 of which the following may be mentioned. Living foliage of *Hibiscus esculentus* was attacked by *Cercospora malayensis* [*R.A.M.*, xi, p. 130]. *C. neovignae* nom. nov. is the proposed designation for *C. vignae* Rac. (non Ell. et Ev.) and *C. raciborskii* Mats. et Nag. (non Sacc. et Syd.) on living cowpea leaves [but see ibid., xiii, p. 657, where the new name *C. vignae-sinensis* Tai & Wei (1933) is proposed for this fungus].

C. mucunae-ferrugineae n. sp. forms irregular, yellowish-brown, later dingy brownish-black, ultimately dark brown to brownish-grey, confluent lesions, often covering a large part of the surface, on living leaves of *Mucuna ferruginea*. It is characterized by pale olive hyphae, 2 to 3 μ in diameter, which emerge from the stomata and cover the spots with a creeping olivaceous mycelium; simple or branched, straight or curved, stipitate, continuous or 1- to 7-septate, pale olive-brown conidiophores, arising singly or in groups of two or more from the stomata or singly from the superficial mycelium, 13 to 62 by 3 to 4 μ; and pale olive, cylindrical or

obclavate-acicular, straight or slightly curved, 1- to 12-septate conidia, 23 to 130 by 3 to 4·5 μ.

Thung (T. H.). **Phytopathologische waarnemingen.** [Phytopathological observations.]—*ex* Jaarverslag 1 Mei 1932–30 April 1933.—*Proefstat. Vorstenlandsche Tabak, Meded.* 77, pp. 34–48, 3 figs., 1934.

The new form of tobacco mosaic, characterized by wispy leaves, to which attention was drawn in the previous report [*R.A.M.*, xii, p. 118], again caused severe damage at Ketandan, while at Wedi the same virus produced an extensive white spotting of the foliage. There is stated to be no doubt that ordinary mosaic is disseminated by coolies in the course of cultural operations [cf. ibid., xiii, p. 730], and it is reasonably certain that the Java manufactured tobacco constitutes the mosaic reservoir for the Vorstenland.

The results of two years' observations afford no definite clue as to the cause of the varying prevalence of slime disease [*Bacterium solanacearum*: ibid., xiii, p. 659] on different plots of the same field.

In general the incidence of 'lanas' disease [*Phytophthora parasitica nicotianae*: ibid., xii, p. 471] was low during the period under review, but on a number of new plantations in which sugarcane preceded tobacco considerable damage was observed. It was ascertained that during the cane period the fields had all been irrigated with water from old tobacco areas. Sulphuric acid (7½ l. of a 2·5 per cent. solution per sq. m.) showed some promise, when applied about three weeks before planting, as a soil disinfectant, but cannot be used on a commercial scale unless its injurious action on the foliage can be prevented, e.g. by subsequent applications of lime.

Mildew [*Erysiphe cichoracearum*: ibid., xii, p. 118] caused much more extensive injury than in 1931.

Thung (T. H.). **Bestrijding der krul- en kroepoek-ziekten van Tabak.** [Control of the curl and crinkle diseases of Tobacco.]—*Proefstat. Vorstenlandsche Tabak, Meded.* 78, 18 pp., 3 diags., 1934. [English summary.]

During the growing season of the Vorstenland (Java) tobacco crop the plants are visited by numerous whiteflies (Aleyrodidae, probably a species of *Bemisia*), which have already been shown to transmit the viruses of the curl and crinkle diseases [*R.A.M.*, xi, p. 478; xiii, p. 274]. The insects come from many weeds, but an extensive series of infection experiments with whiteflies from different food plants showed that only three, namely, *Ageratum conyzoides, Synedrella nodiflora*, and *Vernonia cinerea*, which occur in profusion in the Klaten district and elsewhere near the outskirts of villages, normally are capable of serving as a source of infection to tobacco. In a few cases infection was transmitted from cassava and (more doubtfully) from cucumber. But the three first-named weeds are those which normally carry the disease over during the time when there are no tobacco plants in the fields. Practical control of the diseases was secured in 1933 by the timely removal (in the middle of June, July, and August) of these three

main sources of infection over a radius of some 50 m. round the villages. The work was inexpensively carried out by gangs of children, and its value shown by the virtual absence of curl and crinkle from the eradicated areas in comparison with the heavy damage occurring where these measures were not taken.

VALLEAU (W. D.). **Rhizoctonia bataticola causing sore shin of Tobacco in Kentucky.**—*Plant Disease Reporter*, xviii, 9, p. 117, 1934. [Mimeographed.]

Rhizoctonia bataticola [*Macrophomina phaseoli*] was isolated in July, 1934, from tobacco plants near Murray, Kentucky, suffering from 'sore shin' [cf. *R.A.M.*, ix, p. 561; xi, p. 104]. Some 5 to 10 per cent. of the stand was affected by the disease, which was marked in the early stages by the burning or wilting of the lower leaf tips, followed by their gradual death. Large, black lesions next developed on the stalk round the leaf base, following a die-back of the midrib. The pith decayed in advance of the injury to the leaf and this was preceded by a dark streaking of the cambium. Infection evidently occurred early.

MCWHORTER (F. P.). **Additional note on the English form of Tomato spotted wilt in Oregon.**—*Plant Disease Reporter*, xviii, 5, p. 48, 1934. [Mimeographed.]

No evidence was forthcoming among the ornamental plants or weeds growing in association with tomatoes affected by the English form of spotted wilt in Oregon [*R.A.M.*, xiii, p. 662] of a native virus disease as a potential source of infection. It is concluded, therefore, that the disorder must have been introduced on seed imported direct from England.

CHAMBERLAIN (E. E.). **Tomato mosaic. Its appearance, cause, and preventive treatment.**—*New Zealand Journ. of Agric.*, xlviii, 6, pp. 344–351, 5 figs., 1934.

Tomatoes in New Zealand, especially under glass, are sometimes seriously affected both by mild [ordinary] and severe [? aucuba] mosaic, the symptoms of which are very briefly described [*R.A.M.*, xii, p. 731]. In a small range of field trials at Palmerston North, the average yield of diseased plants was reduced by 39 and 91·2 per cent. by mild and severe mosaic respectively, and both diseases were transmitted from tomato to tobacco, Cape gooseberry (*Physalis peruviana*), and black nightshade (*Solanum nigrum*). The mild form is prevalent on tobacco in the Nelson and Auckland districts, and was also identified in naturally infected Cape gooseberry sent to the laboratory. Severe mosaic is not known to occur naturally on any host other than the tomato in New Zealand.

The fact that in a trial at the Plant Research Station healthy tomato plants growing alongside plants infected with mild or severe mosaic did not contract the diseases, although the aphids *Macrosiphum gei* and *Myzus persicae* were abundant on the diseased and healthy plants during the early part of the season, is considered to indicate that spread of the diseases by these insects is not extensive in the field. The indications are rather that both

mild and severe mosaic are mainly disseminated in New Zealand by pruning knives and the hands of the cultivators, and experience at the Station has shown that the virus may be removed from the hands by thorough washing with soap and running water. In a glasshouse test it was further shown that of 84 plants grown from seed collected from mild mosaic plants, five developed the disease, and evidence obtained from commercial glasshouses in the Nelson district would indicate that the use of seed from infected plants is an important factor in perpetuating the disease from one season to the next [cf. ibid., xiii, p. 648]. Inoculation experiments showed that the incubation period varies from six days in the summer to three weeks in the winter. Once mosaic has appeared in a crop, an interval of about 14 days should be left between prunings, so that there will be sufficient time for all plants infected at one pruning to show the characteristic symptoms and to be removed before the next pruning.

Rischkow [V. L.] & Karatschewsky [I. K.]. **Ueber die Entstehung von 'Fern-Leaf' bei Tomaten.** [On the origin of 'fern leaf' in Tomatoes.]—*Phytopath. Zeitschr.*, vii, 3, pp. 231–244, 9 figs., 1934.

Of 28 tomato seedlings (Markwunder variety) inoculated under controlled conditions (at Simferopol, Russia) with the mosaic virus, 17 contracted the typical fern-leaf and filiform symptoms [*R.A.M.*, xii, p. 778] within a period of 7 to 14 days. The juice of the diseased plants was found, on inoculation into a fresh series of seedlings, to have an intensified virulence resulting in 100 per cent. fern-leaf infection.

In the infected tomato seedlings the leaves were involved to a very variable extent from a few lobes or the tips to the entire surface; in the latter case only the main or lateral veins were left, and some of the leaves presented the appearance of thin tendrils. Where a leaf blade remained, mosaic symptoms were more or less apparent though sometimes almost masked. The flowers of diseased plants were often stunted, with narrow sepals and petals, and frequently fell without producing fruit.

The virus extracted from the fern-leaf tomato plants was found to resist desiccation for a period of eleven months, so that it falls into [E. M.] Johnson's group of tobacco mosaic viruses [ibid., x, p. 60]. It also resisted putrefaction for nine months. It survived ten minutes' heating at a temperature of 88° to 92° C., beyond which it was inactivated. Its virulence was retained after passage through Chamberland porcelain candles. Virulence was not appreciably impaired by 30 minutes' exposure to ether fumes. From a consideration of the properties of the virus under observation and from the practically complete success of the needle inoculation experiments undertaken with it, the writers conclude that it is distinct from Mogendorff's infective principle, though the symptoms caused are similar in both cases [ibid., ix, p. 417]. Seven tobacco seedlings inoculated by needle pricks developed chlorosis of the leaves in 4 to 7 days, beginning along the veins at the base and spreading upwards, accompanied by stunting, vesicular puckering of the green parts, disturbance of starch translocation as observed

by Holmes [ibid., xi, p. 334], and malformation, but only in two cases by the filiform symptoms occurring in tomato; the fern-leaf virus was successfully transferred back to tomato, the incubation period in this case being 12 days. Manifestations of the filiform type were further noticed in nature in *Hyoscyamus niger* and *Nicandra physaloides* plants growing in or near mosaic tomato beds, while a severe epidemic of a similar disease was observed in burdock (*Lappa*) [*Arctium lappa*].

Inoculation experiments were also carried out on tomatoes with a number of other viruses to ascertain if they could produce filiform symptoms. Positive results were obtained only in two out of 100 plants inoculated with potato degeneration viruses (miscellaneous), in all three infected by a virus from pepper [*Capsicum annuum*] with profuse growth of shoots and reduction of fruiting [cf. ibid., xii, pp. 119, 402], and in 7 out of 12 inoculated with severe tobacco mosaic. None of the 11 plants inoculated with cucurbit mosaic contracted infection [cf. ibid., v, p. 510; xiii, p. 648]. The similarity of the fern-leaf symptoms to those of certain mutants is pointed out and the suggestion made that there may even be in some cases a symbiotic relationship between the virus and its host plant.

Weber (G. F.). **Studies on nailhead spot of Tomatoes.**—Abs. in *Phytopath.*, xxiv, 7, p. 836, 1934.

The fungus causing nailhead spot of tomatoes, a common and destructive disease in the south-eastern and Gulf States, has been shown by cultural studies to be a species of *Alternaria*, and the new combination *A. tomato* (Cke) is proposed for *Macrosporium tomato* Cke [*R.A.M.*, x, p. 767]. The organism is stated to differ morphologically and physiologically from the early blight pathogen *A. solani*, with which it is liable to confusion owing to the somewhat similar symptoms produced. Conidia of the two species collected in nature or developed in pure culture were found to be consistently distinct from one another.

Day (W. R.). **Development of disease in living trees.**—*Brit. Wood Preserving Assoc. Journ.*, iv, pp. 25–44, 1 pl., 5 diags., 1934.

In this paper, which was read at a meeting of the British Wood Preserving Association in January 1934, the author briefly reviews the environmental and cultural conditions that favour the attack on, and development in, living forest trees in England, of wood-destroying fungi. He gives illustrations drawn, among others, from the attacks of *Stereum spadiceum* on oak, *Ustulina zonata* [*R.A.M.*, xiii, p. 597], *Phytophthora cambivora* [ibid., xii, p. 334], and *P. syringae* on the beech, as well as from various butt rots and heart rots caused by several well-known fungi. A highly important factor tending to increase the susceptibility of whole tree stands to decay-causing organisms is the failure by the silviculturist to recognize that once a tree has begun to form large branches, the central tissues of which have ceased to participate in the active movement of sap, it should no longer be crowded in such a way as to entail the continued death of its branches by

suppression, because of the grave risk of heart-rotting organisms entering the bole from the dead limbs. Of at least equal importance is the fact that debilitated stands, whether owing to diseases of the crown or of the root system, are in a much more favourable condition for the development of timber-decaying organisms, and also that any diseased condition of the large root system leading to its partial or total death inevitably results in the entry of heart-rotting fungi into the main stem. The paper terminates with a brief discussion of control measures.

HRUBY (J.). **Beiträge zur Pilzflora Mährens und Schlesiens.** [Contributions to the fungus flora of Moravia and Silesia.]—*Verh. Naturforsch. Verein Brünn*, lxiv (*1932*), pp. 34–49, 1933. [Received 1934.]

An annotated list, supplemented by a four-page bibliography, is given of 104 Basidiomycetes (Thelephoraceae) occurring in Moravia and Silesia and represented in the herbarium of the Brünn [Brno, Czecho-Slovakia] National Museum. Included in the compilation are seven species of *Aleurodiscus*, including *A. amorphus* on the cortex of conifers [*R.A.M.*, xiii, p. 608], *Stereum gausapatum* and *S. spadiceum* on oak stumps [see preceding and next abstracts], *S. rugosum* [ibid., xiii, p. 334] on poplar, *Carpinus*, oak, beech, and *Prunus mahaleb*. *S. pini* and *S. sanguinolentum* on conifers, and *Hymenochaete tabacina* on *Corylus avellana* and *P. spinosa*.

DAVIDSON (R. W.). **Stereum gausapatum, cause of heart rot of Oaks.**—*Phytopath.*, xxiv, 7, pp. 831–832, 1934.

Many of the unidentified cultures from rotting oaks that have accumulated since 1928 at the Division of Forest Pathology, Bureau of Plant Industry, Washington, D.C., are now referred (as a result of comparison with cultures made from spores) to *Stereum gausapatum* [*R.A.M.*, xiii, p. 334], which has been isolated from *Quercus prinus, Q. alba, Q. coccinea, Q. velutina, Q. rubra*, and *Q.* sp. in seven States. The fungus forms white lines through the wood, giving a characteristic mottled appearance: they usually follow the spring wood vertically but often branch and sometimes penetrate through the annual growth rings. In the final stages of decay all the wood becomes pale and brittle. Investigations by Nelson and Hedgcock in 1928 of a third-generation coppice in Pennsylvania are stated to indicate the increasing importance of *S. gausapatum* as an agent of decay in sprout-grown oaks. *S. spadiceum*, given by Burt as a synonym of *S. gausapatum*, causes a rot of standing oaks in France [ibid., xii, p. 796].

BOUDRU (M.). **L'oïdium du Chêne.** [Oak mildew.]—*Bull. Soc. Centr. Forest. Belgique*, xli, 7, pp. 270–283, 1934.

A popular account is given of oak mildew (*Microsphaera quercina*) [*R.A.M.*, xii, p. 542], the chief points dealt with including the symptoms of the disease, the morphological and biological characters and manner of overwintering of the causal organism, spread over Europe, varietal resistance [ibid., vi, pp. 198, 452; xi, p. 767], and control [ibid., viii, p. 687]. The resistant varieties are stated to include *Quercus macrocarpa, Q. nigra, Q. phellos*, and *Q. palustris*.

In Belgian nurseries excellent control is given by spraying at the end of May and about the middle of June with 0·2 per cent. potassium sulphide.

A bibliography of 27 titles is appended.

KELLERMAN (K. F.). **Status of the Dutch Elm disease.**—*Plant Disease Reporter*, xviii, 7, p. 101, 1934. [Mimeographed.]

In an area of some 1,400 sq. miles around the port of New York and involving portions of New York State, New Jersey, and Connecticut, the wilting of elms due to *Graphium* [*Ceratostomella*] *ulmi* [*R.A.M.*, xiii, p. 734] was determined in 1933, while in spite of active eradication measures during the winter more than 1,000 cases were found, as a result of overwintering of the infection, in the early summer of 1934. Up to 1st July a total of 1,706 diseased trees had been reported in this area, and it is estimated that there may be as many as 5,000 showing symptoms. This is exclusive of the current season's infections which have not yet had time to become visible.

GOIDÀNICH (G.). **La verticilliosi dell' Acer platanoides L., dell' Acer pseudoplatanus L. e della Maclura aurantiaca L.** [Verticilliosis of *Acer platanoides* L., *Acer pseudo-platanus* L., and *Maclura aurantiaca* L.]—*Boll. R. Staz. Pat. Veg.*, N.S., xiv, 2, pp. 268–272, 3 figs., 1934. [English summary.]

In 1933 the foliage of an *Acer platanoides* tree growing at Bologna suddenly wilted. The tree was cut down, and a *Verticillium* with micro-sclerotia [*R.A.M.*, xii, p. 338] was found in the wood. The fungus had long been present in all parts of the trunk, as well as in the roots, but in the smaller branches it was confined to the previous year's ring. The affected parts were very irregularly distributed, the tree, contrary to the behaviour of this species in America [ibid., v, p. 641] having strongly resisted the spread of the mycelium; there was no outward sign of infection, the bark remaining unaltered.

Tracheomycosis due to a similar *Verticillium* was observed on one- and two-year old sycamore (*A. pseudo-platanus*) trees (the first record in Italy on this host) in nurseries at Padua where *A. platanoides* and *Maclura aurantiaca* were also affected, the wood of the last-named showing a chestnut-coloured discoloration. This is stated to be the first record of the disease on *Maclura*.

These cases confirm the widespread nature of tracheoverticilliosis in Italy, where nursery stock is particularly susceptible.

MILLER (P. W.). **Bacterial blight on native Hazel in Oregon.**—*Plant Disease Reporter*, xviii, 9, pp. 117–118, 1934. [Mimeographed.]

Attention is drawn to the recent detection of bacterial twig blight on the native wild hazel (*Corylus californica*) [*C. rostrata* Ait.] in Oregon, the causal organism being indistinguishable in culture from that responsible for the similar disease of the cultivated filbert (*C. avellana*) [? *Bacterium juglandis*: *R.A.M.*, x, p. 163]. The pathogenicity of the bacterium from *C. californica* to *C. avellana* was experimentally demonstrated. This is believed to be

the first definite record of the occurrence of bacterial blight on the wild hazel.

Demaree (J. B.), Fowler (E. D.), & Crane (H. L.). **Control of Pecan roset with zinc sulfate.**—*Proc. 28th Ann. Convent. South-eastern Pecan Growers' Assoc.*, pp. 29–37, 1934. [Abs. in *Chem. Abstracts*, xxviii, 19, p. 6233, 1934.]

The best control of pecan rosette in the south-eastern United States [*R.A.M.*, xiii, p. 135] was obtained by spraying the leaves of growing shoots with a solution of zinc sulphate (1 lb. in 50 galls. water), the first application being given in April, followed by two more at monthly intervals. Satisfactory but less striking results were secured by combined treatment with zinc sulphate and Bordeaux mixture, while a stimulatory effect (still noticeable in the second year) was further exerted by the injection into the trunk of dry zinc sulphate (0·5 to 1·5 lb. per in. of circumference). The effect of soil treatment with zinc sulphate was slower and less uniform than the preceding.

Demaree (J. B.) & Large (J. R.). **Injurious effects of Bordeaux mixture on Pecan trees.**—*Proc. 28th Ann. Convent. South-eastern Pecan Growers' Assoc.*, pp. 20–29, 1934. [Abs. in *Chem. Abstracts*, xxviii, 19, p. 6238, 1934.]

Even at very dilute concentrations Bordeaux mixture has been found to cause three distinct types of injury to pecan trees (1) marginal and apical leaf burning followed by a checking of growth in very young foliage; (2) brown spotting and necrosis in June or July after the second or third application, succeeded in a week or two by the shedding of 25 to 50 per cent. of the older leaflets; and (3) in periods of drought only, coincident with increased transpiration, wilting of the nuts, chlorosis and shedding of the leaves, and usually failure of blossom in the next year. No injury is caused by a spray consisting of 2 lb. copper phosphate, 4 lb. hydrated lime, and 2 lb. bentonite [*R.A.M.*, xiii, p. 715] in 50 galls. of water, but the pecan scab fungus [*Cladosporium effusum*: ibid., xiii, p. 135] is not so effectively combated by this compound, or by sulphur-containing mixtures, as by Bordeaux mixture.

Celino (M. S.). **Blight of Cinchona seedlings.**—*Philipp. Agric.*, xxiii, 2, pp. 111–127, 2 pl., 2 figs., 4 graphs, 1934.

In February 1932 a severe epidemic of disease among *Cinchona* seedlings in the Los Baños College of Agriculture was reported, and in January, 1933, another serious attack occurred on 45·45 per cent. of a batch of seedlings raised from seed supplied by the College of Forestry. The disease assumed the form of sudden decay and desiccation of the young shoots without obvious preliminary changes. Infection progressed downwards from the tips and caused gradual withering of the stem and leaf petioles, followed by the death of the leaves, which generally remained attached to the plants. The plants were killed in five or six days under moist conditions.

A species of *Phytophthora* was readily isolated from diseased

material and cultured on standard media [cf. *R.A.M.*, xi, p. 426]. It was characterized by a coarse, irregular, profusely branched submerged mycelium with hyphae averaging 6·65 μ in diameter, compared with 5·47 μ for those of the more slender aerial growth. The conidiophores ranged from 2·5 to 6·3 μ (average 3·58 μ) in width and bore, terminally or laterally, subspherical, oval, or elongated, hyaline to pale yellow, densely granular, apically papillate conidia, measuring 19·5 to 97·49 by 15·5 to 51·49 μ (average 48·63 by 32·06 μ). The spherical, smooth, terminal or intercalary chlamydospores, slightly deeper in colour than the conidia, range from 19·5 to 51·49 μ in diameter (average 35·89 μ). Zoospores were formed in the presence of abundant moisture in 20 to 25 minutes at 15° C. They remained actively motile for about half an hour, subsequently producing germ-tubes some 10 to 20 minutes after settling. They are slightly elongated and pointed in motion, spherical when at rest, pale greenish, granular, and measure 8·4 to 12·6 μ in diameter (average 10·75 μ). The dimensions of the fungus [which are fully tabulated] are considered to agree sufficiently well with those of *P. faberi* [*P. palmivora*: ibid., xiii, p. 12 and above, p. 764] to permit its reference to this species.

Positive results were obtained by inoculation experiments on unwounded seedlings of the *C. hybrida* and *C. calisaya* var. *ledgeriana* varieties, both of which, with *C. succirubra*, had been severely infected under natural conditions. Good control was secured by the excision and burning of diseased material, supplemented by two applications, at a fortnight's interval, of standard Bordeaux mixture.

HIRATSUKA (N.). **Inoculation experiments with heteroecious species of the Japanese rust fungi II.**—*Bot. Mag.*, Tokyo, xlviii, 571, pp. 463–466, 1934.

The alternate hosts of *Coleosporium campanulae* from *Adenophora verticillata* var. *typica* were found to be *Pinus thunbergii* and *P. densiflora*, while that of *C. asterum* from *Aster leiophyllus* is *P. densiflora* [cf. *R.A.M.*, xiii, p. 201]. The aecidiospores of the former species were successfully inoculated into *Adenophora verticillata* vars. *typica* and *triphylla*, *A. nikkoensis* var. *genuina*, and *A. takedai*, while those of the latter infected only *Aster leiophyllus* of the five plants tested.

The spermogonia of *C. campanulae* on *P. thunbergii* are yellowish-brown, low-conical, 50 to 80 μ in height and 0·5 to 1·2 mm. across; the aecidia are up to 3 (occasionally 7) mm. long, and 0·8 to 1·5 mm. high; the peridial cells are ovoid to ellipsoid, slightly overlapping, often tapering at one or both ends, 40 to 60 by 20 to 36 μ, with closely verrucose inner walls, 9 to 18 μ in thickness, and thin, smooth outer ones; and the orange-yellow aecidiospores are ellipsoid, ovate, or oblong, 22·5 to 36 by 16·5 to 24 μ, with a colourless epispore 2·5 to 4·2 μ.

KAMEI (S.). **Identification of a peridermial stage on the seedlings of Abies mayriana and the injury caused thereby.**—*Trans. Sapporo Nat. Hist. Soc.*, xiii, 3, pp. 153–161, 3 figs., 1934.

By means of inoculation experiments the writer traced a genetic

connexion between a white *Peridermium* attacking *Abies mayriana* needles in the Sapporo district of Japan and *Uredinopsis hirosakiensis* on *Dryopteris thelypteris* [*R.A.M.*, xi, p. 813]. The rust is stated to cause considerable damage on nursery seedlings of *A. mayriana*.

LEPIK (E.). **Sõstra-viltrooste geograafilisest levikust.** [On the geographical distribution of the blister rust of White Pine.]—*Mitt. Phytopath. Versuchsstat. Univ. Tartu* [*Dorpat*] 21, 7 pp., 2 figs., 3 maps, 1934. [German summary.]

In this paper the author gives a brief outline of the history of the white pine blister rust (*Cronartium ribicola*) [*R.A.M.*, xiii, p. 666 and above, p. 738], followed by a few notes on its early distribution in the northern hemisphere, which at the present day practically coincides with that of the eastern white pine (*Pinus strobus*).

LACHMUND (H. G.) & HANSBROUGH (J. R.). **Survival of blister-rust mycelium in Western White Pine.**—*Journ. Agric. Res.*, xlviii, 11, pp. 1043–1047, 1934.

Following the reports from numerous investigators that squirrels and other rodents frequently eat the infected bark of white pine (*Pinus monticola*) blister rust cankers (*Cronartium ribicola*) [see preceding abstract], and occasionally completely sever the branch at the point of infection, the authors conducted experiments during 1927–8 in British Columbia to obtain definite information on the effect of this phenomenon on the survival of the mycelium of the rust in the branches thus mutilated. The results showed that the stubs of cankered branches which were cut off so as to leave about half an inch of living canker on the tree, remained alive for periods ranging up to five years, or until the mycelium entered the bole of the tree, whereas the stubs of comparable uninfected branches treated in the same way were practically all dead within a year. There was some evidence that the mycelium stimulated a reversal of the flow of assimilates into the stubs from the trunk. The downward growth of the cankers in the cut infected branches proceeded at a constant rate slightly less than that of normal cankers [*R.A.M.*, xiii, p. 606], but was almost identical with that in branches which had been 'flagged' (i.e., whose distal portion had been killed by the canker). On such branches, however, the cankers survived for a shorter time than the cankers that had been experimentally cut.

STOLTENBERG (E.). **Snemugg (sneskytte).** [Snow mould (snow leaf fall).]—Reprinted from *Tidsskr. for Skogbruk*, 7–8, 14 pp., 1934.

A discussion, based on the writer's observations during the last 18 years in west Telemark, Norway, is given of the factors governing the infection of young Scotch firs [*Pinus sylvestris*] by the snow mould (*Phacidium infestans*) [*R.A.M.*, xi, p. 136]. Chief among these appears to be the occurrence of heavy spring snowfalls which form a thick covering over the plants, affording optimum conditions for the development and spread of the fungus.

The mycelium seems to pass direct from one needle to the next, killing them and the buds. The dead needles may remain attached to the branches for some years and thus assist in the spread of the fungus. As a rule the critical stage for infection in the growth of the tree is between the heights of 0·25 and 1·40 m. Ill-nourished trees on poor soil have been found the most susceptible to *P. infestans*. Control should be based on silvicultural methods calculated to improve the vigour of the stands.

BRAID (K. W.). **History of the Bracken disease.**—*Scottish Journ. of Agric.*, xvii, 3, pp. 207–305, 1934.

Four types of the bracken [*Pteridium aquilinum*] disease [*R.A.M.*, xii, p. 139] are recognized, namely, (1) 'hook disease' (possibly the result of frost injury), in which the 3- to 6-inch 'hooks' are soft, semi-rotten, discoloured dark brown or black, and full of bacterial growth; (2) Knoweside type, characterized by general lack of vigour, dwarfing of the fronds, which often bear brownish or black, lozenge-shaped markings on the 'stems', branches, and leaflets, the whole suggestive rather of decline than of active fungal infection; (3) Garelochhead type, the more virulent forms of which are highly destructive [ibid., viii, p. 412] and may be due to an associated fungus which, however, has not been isolated as yet; and (4) the Milngavie type, from which *Corticium anceps* was isolated by Mrs. Gregor [ibid., xii, p. 132].

The first record of the bracken disease appears from a typical specimen in the Kew Herbarium to date back to 1865, but the present investigations were initiated by Mrs. N. L. Alcock, in collaboration with the writer, in 1926.

HUBERT (E. E.). **Tests on the relative resistance of wood to decay.**—*Univ. of Idaho Bull.*, xxix, 7 (*School of Forestry. Bull.* 5), 23 pp., 3 figs., 1934.

In further tests [which are described and the results of which are tabulated and discussed] conducted in Idaho on the relative resistance of different species of commercial wood blocks, wall boards, insulators, sawdust, shavings, and charred wood to attack by *Lenzites trabea* [*R.A.M.*, ix, p. 149; xiii, p. 556] evidence was obtained that the moisture percentage based on oven-dry weight for such products as wall-boards and insulators is not a reliable indicator of the loss in weight due to fungal attack. The effects of water-repellent materials in these products, however, strikingly demonstrated the value of this type of protection. Preliminary tests indicated that charring increases the resistance of wood to decay by *L. trabea*. As before, the difficulty of controlling the various factors influencing the rate of decay prevented exact information being obtained as to the specific resistance of the various timbers tested. A summary is given of the results obtained up to date with *Lentinus lepideus*, *Lenzites sepiaria*, and *L. trabea* on a number of commercial woods and some data are given on the effect of *L. trabea* on *Picea engelmanni* already partially rotted by *Stereum sulcatum* [ibid., xii, p. 605] and on *Abies grandis* rotted by *Echinodontium tinctorium* [ibid., xi, p. 614], which showed

that a loss of weight of 23·8 and 16·2 per cent., respectively, was produced in eight months.

RUDGE (E. A.). **Studies in the decomposition of timber under industrial conditions. VII. Telegraph poles.**—*Journ. Soc. Chem. Ind.*, liii, 28, pp. 208T–211T, 3 figs., 1 diag., 1934.

From an examination of three specimens of decayed telegraph poles, sections through which showed regularly spaced 'ring-shakes' (cracks) containing aluminium and calcium, it is concluded that decomposition is initiated by the presence of moisture in sufficient quantities to maintain free ionic movement within the substance of the wood. Under such conditions the inorganic constituents migrate into zones of high concentration concentric with the annual rings, producing areas of low lateral strength, probably in correlation with the formation of cellulose compounds and degradation products. The subsequent stages of disintegration are associated with a complex series of changes, ultimately involving attacks by micro-organisms and resulting in complete decay [see above, p. 739].

Creosote is effective in the later stages of decay by reason of its fungicidal action, but in the initial phases its efficacy depends entirely on its capacity to exclude the infiltrating ions by sealing the pores of the wood.

Simple visual tests are stated to be useless for the detection of the earlier stages of disintegration due to infiltration, but chemical analysis reveals the abnormally high ash content which is a characteristic feature of ionic intrusion.

VANINE (S. I.) & VLADIMIRSKAYA (Mme N. N.). О действии некоторых газов на грибницу домовых грибов и о глубине проникновения газов в древесину. [On the action of certain gases on the mycelium of house fungi, and on the depth of penetration of gases into wood.]—*Acta Inst. Bot. Acad. Scient. U.R.P.S.S.*, Ser. iv (*Bot. Experimentalis*), Leningrad, *1934*, 1, pp. 205–222. 4 figs., 1934. [German summary.]

This is a somewhat expanded account of the authors' laboratory experiments to test the possibility of controlling house fungi (*Merulius lacrymans* and *Coniophora cerebella*) in buildings by fumigation with gases and volatile substances, such as chlorine, chloro-picrin, acetic acid, etc., and also to determine the depth to which the gases and vapours of these substances penetrate into wood, a report of which has already been noticed [*R.A.M.*, xii, p. 261].

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vi, 4, p. 72, 1934.

CHINA. In accordance with an announcement of the Shanghai Tariffs Commissioner, dated 13th February, 1934, specimens of viruses, bacteria, fungi, protozoa, and insects injurious to agriculture may in future only be imported into China by way of Shanghai, and must be accompanied by a special permit from the Ministry of Industry.

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